1988 AIR QUALITY
DATA SUMMARY
REGIONAL MUNICIPALITY OF WATERLOO
AND THE
COUNTY OF WELLINGTON

SEPTEMBER 1990

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1988 AIR QUALITY DATA SUMMARY

REGIONAL MUNICIPALITY OF WATERLOO AND THE COUNTY OF WELLINGTON

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West Central Region
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Air Quality Assessment
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ABSTRACT

This report summarizes the results of air monitoring in the Regional Municipality of Waterloo and County of Wellington in 1988.

General ambient air quality as characterized by stations in Guelph and Kitchener was very good.

Monitoring near industrial sources showed some local air quality problems existed and include:

1) Dolime quarry in Guelph where particulate emissions have occurred. Scrubbers were installed on the plant's lime kilns in late 1987 and were successful in reducing stack emissions of particulates. The remaining sources of dust in the area are now mainly fugitive in nature (construction, truck traffic, etc.).

2) Breslube in Breslau where upsets and fugitive emissions have caused odours. The installation of a new oil cleaning process and associated incinerator in 1988 reduced odorous emissions as indicated by a reduced frequency of odour complaints.

3) Date Industries in Ayr where particulate fallout occurred. A Control Order was issued to the company in 1989 followed shortly later by installation of the control equipment.

TABLE OF CONTENTS

	PAGE
INTRODUCTION	1
MONITORING NETWORK	2
POLLUTANTS MONITORED	4
DATA ANALYSIS	
Ayr	9
Breslau	12
Guelph	16
Kitchener/Waterloo	25
Puslinch Township	39
SUMMARY	42

LIST OF FIGURES

			PAGE
Figure	1	Wind Frequency Distribution - 1988	3
	2	Ayr Air Monitors	10
	3	Breslau Air Monitor	14
	4	Dustfall - Breslube - Trend	15
	5	Guelph Air Monitors	19
	6	Sulphur Dioxide - Exhibition Park, Guelph - Pollution Rose	20
	7	Sulphur Dioxide - Guelph - Trend	21
	8	Ozone - Exhibition Park, Guelph - Pollution Rose	22
	9	Soiling Index - Guelph - Pollution Rose	23
	10	Suspended Particulates - Guelph - Trend	24
	11	Kitchener/Waterloo Air Monitors	28
	12	Sulphur Dioxide - Kitchener - Trend	29
	13	Carbon Monoxide - Kitchener - Trend	30
	14	Nitrogen Dioxide - Kitchener - Trend	31
	15	Ozone - Kitchener - Trend	32
	16	Sulphur Dioxide - Kitchener/Waterloo - Pollution Roses	33
	17	Carbon Monoxide - Edna/Frederick, Kitchener - Pollution Rose	34
	18	Nitrogen Dioxide - Edna/Frederick, Kitchener - Pollution Rose	35
	19	Ozone - Kitchener/Waterloo - Pollution Roses	36
	20	Soiling Index - Kitchener/Waterloo - Pollution Roses	37
	21	Suspended Particulate - Kitchener- Trend	38
	22	Puslinch Township Air Monitors	41

LIST OF TABLES

Data Summaries - 1988

			PAGE
Table	1	Air Quality Index - Frequency Distribution West Central Region	8
	2	Microscopic Analysis of Dustfall - Ayr	11
	3	Particulates (Dustfall) Near Breslube	13
	4	Guelph Air Quality Statistics	18
	5	Kitchener/Waterloo Air Quality Statistics	27
	6	Particulates (Dustfall) Near Capital Paving Puslinch Township	40

INTRODUCTION

This report summarizes the results of air monitoring in the Regional Municipality of Waterloo and the County of Wellington in 1988.

The Ministry of the Environment's West Central Region has conducted routine monitoring in the area since the early 1970's. The Air Management Program in Ontario is based on controlling man-made emissions to meet ambient air quality objectives. These in turn are based on known effects on health, quality of life or sensitive vegetation, whichever is most stringent. To achieve these objectives, sources of pollution are identified, their emissions evaluated and appropriate control measures are instituted. Ambient air monitoring is used to identify pollution sources, evaluate the need for controls and then determine whether controls have been successful.

In addition to monitoring specific industrial sources, monitoring of a more general nature is also carried out in various localities to ensure that air quality objectives are being met and to observe trends in air pollution.

In June 1988, the Ministry commenced broadcasting the new Air Quality Index across the Province at over 30 locations, including stations in Guelph, Kitchener and Waterloo. A description of the AQI and the 1988 results will appear later in this report.

MONITORING NETWORK

The Ministry of the Environment's West Central Region operates a network of monitors in the area in Ayr, Breslau, Puslinch Township, Guelph, Kitchener and Waterloo. Much of the monitoring was performed near industrial sources, in many cases, as a response to local complaints. Monitoring of a more general nature was also carried out at single stations in Guelph, Kitchener and Waterloo to characterize air quality in larger population centres and to measure the Air Quality Index. The station in Waterloo started operations in June, 1988 in order to broadcast its AQI.

Meteorological data (wind speed and direction) are not measured by the Ministry in the area. However, data measured by the University of Guelph at their Elora Research Station is provided to the Ministry for data analysis. Figure 1 illustrates the wind frequency distribution for the area and shows that winds from the southeast, south and northwest quadrants predominated almost 50% of the time. Consequently, wherever possible, stations are located "downwind" of suspected pollution sources with respect to these winds.

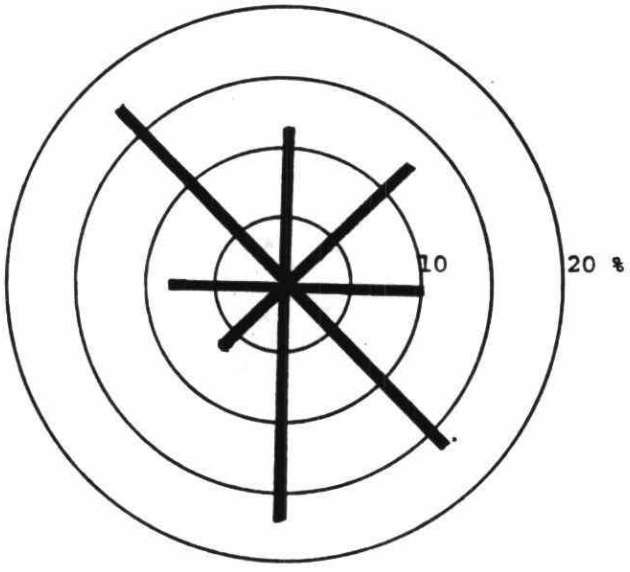
Wind data were utilized in a computer program known as a "pollution rose" - essentially a cross-tabulation of average hourly pollutant concentrations with wind direction. The data from this program are illustrated on various maps in this report and are a useful tool in determining the impact on any given source on a monitoring station. The length of each line of the "rose" is proportional to the average concentration when the wind was blowing from that direction.

FIGURE 1
WIND FREQUENCY DISTRIBUTION

ELORA RESEARCH STATION

BY UNIV. OF GUELPH

1988



Lines indicate direction from which wind blew

POLLUTANTS MONITORED

Two basic types of air pollutants are measured-gases and particulates (dust).

a) Gases measured with continuous analyzers include:

- Sulphur Dioxide (SO_2) - monitored in Guelph, Waterloo and Kitchener for general ambient levels. SO_2 is a product of fuel combustion. Air quality criteria and their limiting factors are:

  1-hour average - .25 ppm (vegetation effects)
  24-hour average - .10 ppm (health effects in conjunction with particulates)
  1-year average - .02 ppm (vegetation effects)

- Carbon-Monoxide-(CO) - general ambient levels are measured in Kitchener. The major source of CO is the automobile. Criteria for CO are:

  1-hour average - 30 ppm (health effects)
  8-hour average - 13 ppm (health effects)

- Ozone (O_3) - measured in Kitchener, Waterloo and Guelph to check general ambient levels. Oxidants are products of photochemical reactions involving oxides of nitrogen, hydrocarbons and sunlight and ozone accounts for most of the oxidants produced. The sources of the precursor pollutants are mainly industrial and automotive. Concentrations follow very definite annual and daily trends with highest levels occurring during the summer, and daily maxima usually occurring in mid-afternoon. Both patterns are directly related to temperature and the amount and intensity of sunlight. Ozone and its precursors can be transported over great distances and can be augmented by local sources. Most of the high levels measured in Southern Ontario each summer arrive from the United States. An objective for ozone is:

  1-hour average - 80 ppb (vegetation effects)

- Oxides of Nitrogen - general ambient levels were measured in Kitchener. They are a product of high temperature combustion sources including the automobile. The most abundant oxides are nitric oxide (NO) and nitrogen dioxide (NO_2). Criteria exist only for NO_2:

  1-hour average - .20 ppm (odour)
  24-hour average - .10 ppm (health effects)

b) Particulates (dust) were measured by three methods, each relating to a different size range of particles.

- Dustfall - heavy material generally greater than 10 microns in size (one micron is one-millionth of a metre) that settles out of the atmosphere by gravity. A plastic container is exposed for one month and the collected dust is weighed and expressed as a deposition rate of grams/square metre/30 days. The measurement is imprecise and observations are restricted to relatively local areas. Criteria are:

  1-month average - 7.0 g/m^2/30 days (nuisance effects)
  1-year average - 4.5 g/m^2/30 days (nuisance) effects)

- Total Suspended Particulates (TSP) - measured with high volume (hi-vol) samplers near industrial sources and for general ambient observations. The particles range from submicron to about 50 microns in size. The hi-vol sampler draws air through a glass fibre filter for a 24 hour period. The exposed filter is weighed and the weight of solids collected is converted to an equivalent concentration in air. Units used are micrograms per cubic metre. The samplers run once every six days. Criteria based on health effects in conjunction with sulphur dioxide are:

  24-hour average - 120 ug/m^3 (health effects)
  1-year geometric mean - 60 ug/m^3 (health effects)

- Soiling Index (Coefficient of Haze) - general ambient levels were measured in Kitchener, Waterloo and Guelph by tape samplers which measure fine particles less than 10 microns. Coefficient of haze tape samplers determine hourly soiling values. Air is drawn through a filter paper tape for one hour. A beam of light is shone through the paper before and after the airborne particles are collected. The difference in light transmission is translated into a coefficient of haze (COH) unit. The paper tape then advances and a new hourly sample is collected. The criteria shown below are based largely on correlations with total suspended particulate (TSP).

  24-hour average - 1.0 COH's/1000 linear feet of air
  1-year average - .5 COH's/1000 linear feet of air

- Air Pollution Index (API) - the API is a subindex of the new AQI. It is derived from 24-hour average concentrations of sulphur dioxide and soiling index, based on the following equation:

Kitchener, Waterloo and Guelph

$$API = 3.33(9.1\ COH + 120.8\ SO_2).^{74}$$

where: COH is the 24-hour average soiling index concentration expressed in coefficient of haze units.

SO_2 is the 24-hour average sulphur dioxide concentration expressed in parts per million.

- Air Quality Index (AQI) - the AQI is a system by which the public can be informed about air quality on a daily and even hourly basis. The index replaced the API (described above) which had been in place since 1970, although as mentioned, the API still exists as a subindex of the AQI.

In the AQI, hourly concentrations of sulphur dioxide, soiling index (particles), nitrogen dioxide, carbon monoxide, ozone and reduced sulphur compounds are all converted to a common scale of numbers. In addition to these hourly measurements, 8-hour average levels of carbon monoxide and the API, a function of sulphur dioxide and particles are also included as subindices making a total of 8 potential subindices measured every hour. The official AQI broadcast is the highest subindex at that time.

The common scale of numbers are classified as follows:

0-15	Very Good
16-31	Good
32-49	Moderate
50-99	Poor
100-	Very Poor

Index levels up to 31 should have little or no effect on people and the environment. Beginning at the moderate level, effects such as odour, vegetation damage and some health effects to sensitive individuals start to occur.

In the poor and very poor categories, these symptoms become more and more acute such that virtually all people would be hampered in the very poor range.

When moderate levels or higher are measured, public health advisories can be issued to the public along with the actual index number.

The AQI started in June 1988 and statistics on hourly frequencies in the five concentration categories for nine West Central Region stations are presented in Table 1.

Although the index only began in June, the AQI results are presented as if the index had been in actual operation for the entire year. As can be seen, ozone (O_3) was the most problematic pollutant across the Region. This pollutant and the others in the AQI will be discussed in more detail in the following sections of this report.

TABLE 1

AIR QUALITY INDEX - 1988

HOURLY FREQUENCY DISTRIBUTION

STATION/ LOCATION	POLLUTANT	0-15 VERY GOOD	16-31 GOOD	32-49 MODERATE	50-99 POOR	100- VERY POOR
26029	SO2	8629	0	0	0	0
	COH	3948	370	78	2	0
KITCHENER	O3	7686	485	172	0	0
	NO2	8178	3	0	0	0
	CO 1 hr	8313	0	0	0	0
	CO 8 hr	8352	0	0	0	0
	API	1598	347	0	0	0
26045	SO2	5077	0	0	0	0
	COH	4908	25	0	0	0
WATERLOO	O3	4458	388	76	1	0
	API	4764	26	0	0	0
28028	SO2	8386	0	0	0	0
	COH	7699	35	1	0	0
GUELPH	O3	7682	496	138	0	0
	API	4952	25	0	0	0
27067	SO2	8280	0	0	0	0
	COH	8384	63	2	0	0
ST.CATHARINES	O3	7350	608	123	0	0
	NO2	6139	0	0	0	0
	CO 1 hr	7311	0	0	0	0
	CO 8 hr	7330	1	0	0	0
	API	8298	123	0	0	0
27056	SO2	8565	0	0	0	0
	COH	8570	47	0	0	0
NIAGARA	O3	4258	463	195	12	0
FALLS	API	8295	307	0	0	0
29000	SO2	8539	1	0	0	0
	COH	7900	583	82	2	0
HAMILTON	O3	8222	402	136	8	0
DOWNTOWN	NO2	8566	4	0	0	0
	CO 1 hr	8564	0	0	0	0
	CO 8 hr	8583	0	0	0	0
	TRS	8396	133	18	0	0
	API	6990	1520	40	0	0
29105	SO2	8479	0	0	0	0
	COH	8025	153	18	0	0
HAMILTON	O3	7767	479	103	5	0
EAST	API	4932	53	0	0	0
29114	SO2	8465	0	0	0	0
	COH	8156	195	9	0	0
HAMILTON	O3	7854	443	151	5	0
MOUNTAIN	TRS	7721	160	26	0	0
	API	4931	122	0	0	0
29118	SO2	6647	0	0	0	0
	COH	7231	460	36	0	0
HAMILTON	O3	7900	428	186	10	0
WEST	NO2	8266	2	0	0	0
	API	4515	449	0	0	0

DATA ANALYSIS

Ayr

Dustfall has been measured at station 26026 - Stanley St. near the Date Industries Foundry since 1976 (Figure 2).

In 1988, all twelve samples exceeded the monthly objective, many by a large margin similar to previous years. Microscopic analysis showed that the samples usually contained mostly foundry materials, carbons, silica and iron oxide. All dustfall data are given in Table 2.

The foundry's effect was very localized and stack emissions and fugitive sources have been identified as requiring better control.

A Control Order was issued to the company in early 1989, and control equipment was installed on the cupola in May. The effectiveness of the equipment now needs to be determined. The Order also requires that the company complete studies by July, 1989 to determine other fugitive emission sources and determine best control measures for them. That study report has now been received by the Ministry. Also, stack testing of the cupola emissions is to be completed by the end of October, 1989.

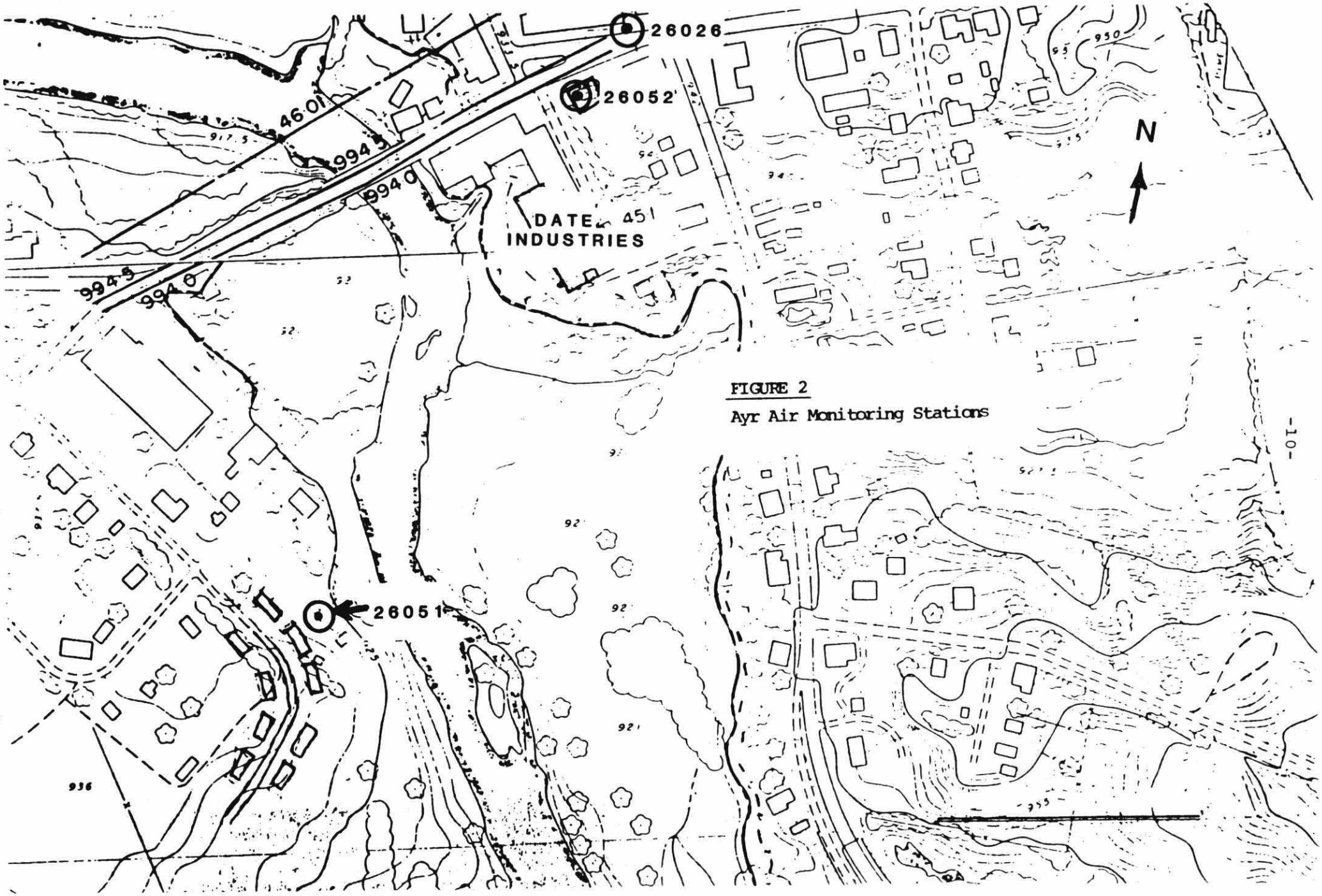


FIGURE 2

Ayr Air Monitoring Stations

TABLE 2

1988 MICROSCOPIC ANALYSIS OF DUSTFALL

VOLUME PERCENTAGES OF INSOLUBLES

STATION: 26026 - STANLEY/SWAN, AYR

SUBSTANCE	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	
GRAPHITE													
COAL	10	8	10				3	5		10			
COKE		58	40	16	58	23	54	35	73	70	80	60	
SOOT	60												
KISH													
FOUNDRY SAND		12	10	3	14	3	5	9	11				
FLYASH	10												
SILICA		5	5	24		8		6					
WOOD CHAR													
WOOD FIBRES				30 chips		37							
CARBONATE			20	25		11		10					
IRON OXIDE	20	18	10	2	13	18	16	35	16	20		30	
BIOLOG. MAT'L			5		15		22						
OTHER											20	10	AVG
TOTAL LOADING g/m2/30 days	15.2 ---	12.7 ---	27.6 ---	19.1 ---	18.2 ---	10.0 ---	11.0 ---	7.7 ---	12.6 ---	9.4 ---	12.9 ---	8.7 ---	13.8

DUSTFALL OBJECTIVES : 7.0 (1 MONTH)
4.5 (ANNUAL AVERAGE)

Breslau

Dustfall near Breslube measured at station 26036 on Fountain Road (Figure 3) increased somewhat in 1988 (Table 3). The monthly objective was exceeded seven times, compared to six in 1987. The increased levels were due to construction activities on the Breslube property and the Forwell gravel pit located behind the Breslube property. This latter source may have become more prominent starting in 1987, due to changing areas of extraction closer to the sampler. The construction activities at Breslube should end by the end of 1989. These activities include paving and construction of buildings and storage tank areas.

Since the greatest potential source of dust at Breslube used to be lime storage and handling, the samples were analyzed for calcium (lime is calcium oxide) and lower calcium concentrations were found in 1988 than in 1986 and 1987, contrary to the dustfall average. Lime usage at Breslube is down considerably from the past. The trends in yearly averages of dustfall and its calcium content are given in Figure 4.

Since all lime at Breslube is enclosed in a large silo, emissions are negligible, and since construction activities were the main source of dust, the sampler was removed in 1988. Dust complaints are no longer received.

With respect to odourous emissions from Breslube, it should be noted that upsets can occur and cause odour problems in the vicinity of the plant and an area of Kitchener. Attempts are being made to minimize these problems. In 1985, a new vacuum distillation system was brought on line, and it was thought that this installation improved air quality. In 1986, several other modifications and procedures were instituted in response to a plant survey and in 1988, a major piece of equipment known as a hydro treater was installed, changing the oil cleaning process. Together with a new incinerator, this will result in better control of odourous emissions as shown by the reduced frequency of odour complaints being received.

TABLE 3

SUMMARY STATISTICS - BRESLAU

PARTICULATES NEAR BRESLUBE LTD.

DUSTFALL - grams/square metre/30 days

ONT.OBJECTIVES : 7.0(1 MONTH)
4.5(ANNUAL AVERAGE)

STATION	ANNUAL AVERAGE 1986	1987	1988	1988 MAXIMUM 1 MONTH	NO.MONTHS OVER OBJECTIVE 1986	1987	1988
26036 - FOUNTAIN RD BRESLAU	5.2	8.4	*8.9	18.0	5	6	7

CALCIUM IN DUSTFALL - grams/square metre/30 days

26036 - FOUNTAIN RD BRESLAU	0.70	0.48	0.42	0.90	No Objective		

* 9 months sampled. Terminated in Oct. 1988

FIGURE 3
Breslau Air Monitoring Station

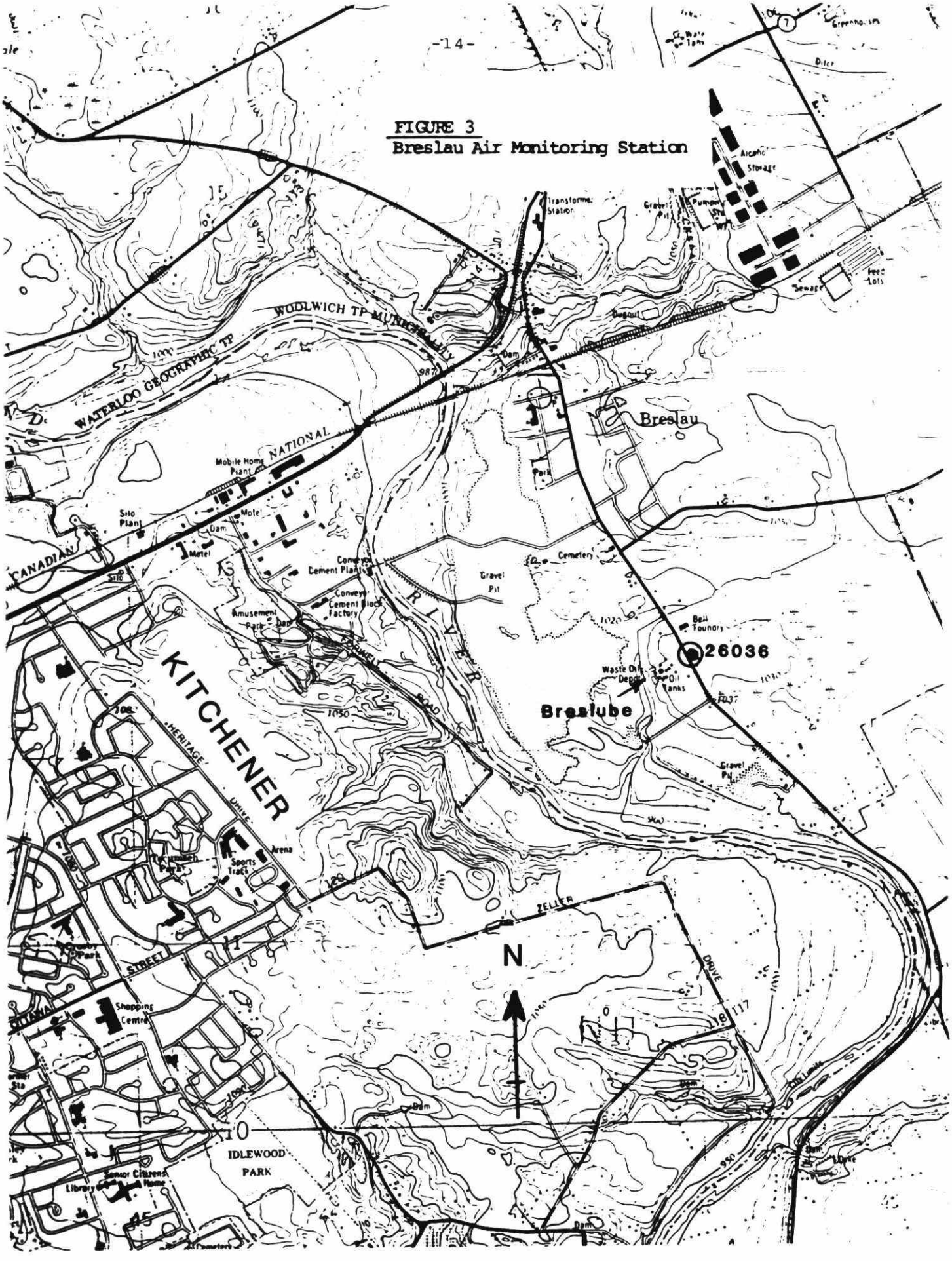
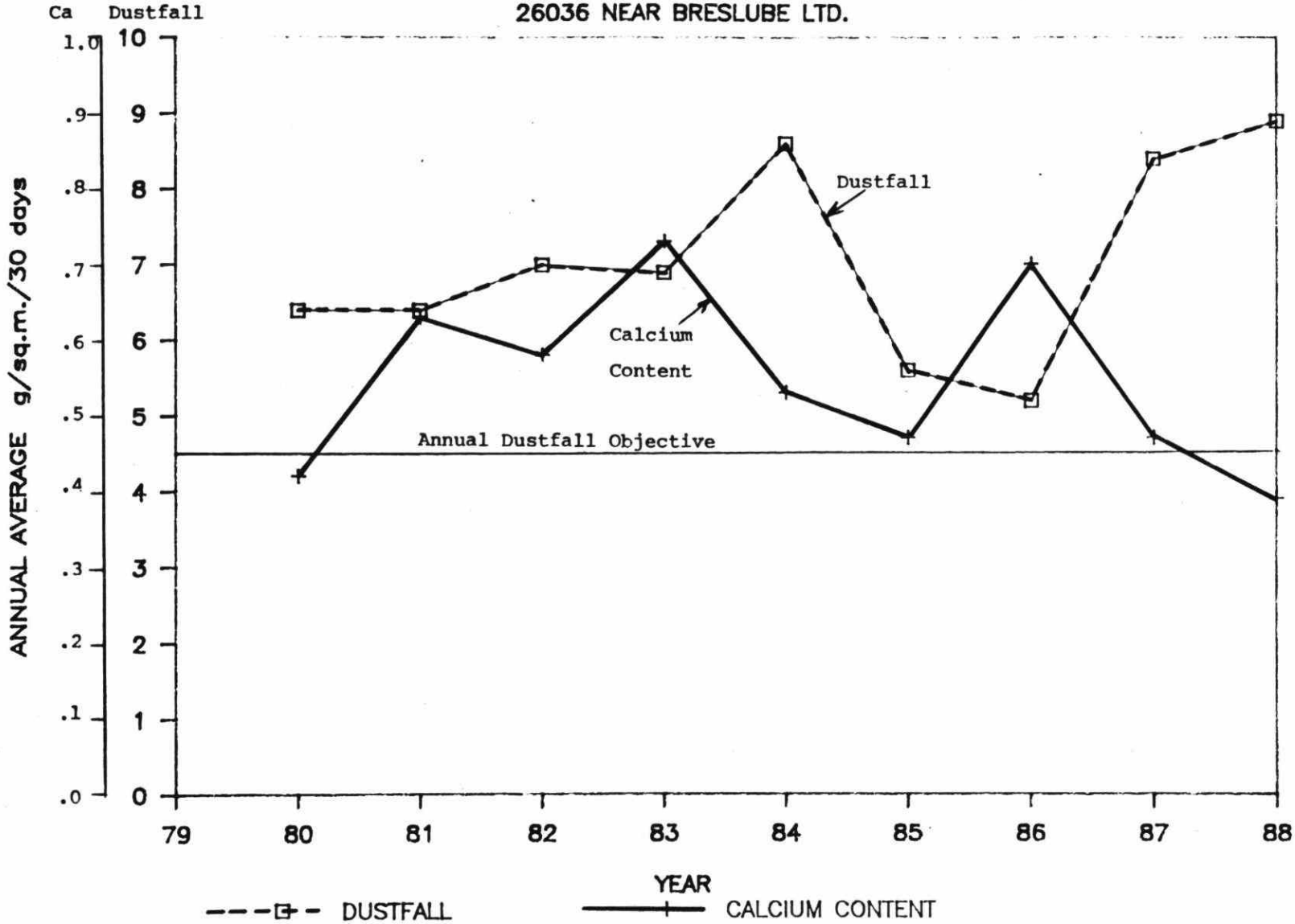


FIGURE 4

DUSTFALL YEARLY TREND



Guelph

The main station (28028) in Guelph to measure general ambient air quality is located at Exhibition Park (Figure 5). Sulphur dioxide continued to record mostly very low levels and all objectives were met (Table 4). The pollution rose in Figure 6 indicates highest average concentrations (albeit very low) arrived from the southeast. The SO_2 trend graph in Figure 7 illustrates the low stable concentrations measured here since 1981, well below the annual objective. In 1988, all SO_2 readings fell in the Very Good range of the new AQI.

Ozone was monitored at station 28028 in 1988 and data are summarized in Table 4. The hourly ozone objective was exceeded during 138 hours, all during the spring and summer and all falling in the Moderate range of the AQI.

Ozone is a photochemical product of the chemical reaction between nitrogen oxides and certain hydrocarbons in the presence of sunlight. The pollution rose given in Figure 8 shows relatively uniform average concentrations from most directions. However, the highest levels all occurred during southerly winds and were largely imported from the United States. At these times levels were high throughout Southern Ontario. The pollution rose probably does not indicate this because the long term averaging of the rose flattens out peak periods. As well, southerly winds do not automatically yield high ozone, even during the summer. Specific meteorological conditions are necessary, namely hot, sunny weather. The summer of 1988 was very hot and resulted in much higher ozone levels throughout Southern Ontario than in previous years.

Soiling index, a measure of fine particles less than 10 microns in size, was also monitored at station 28028. Levels measured were well below the annual objective (Table 4) and the daily objective was not exceeded. The pollution rose given in Figure 9 shows that uniform levels occurred with most wind directions, except northwest winds which yielded very low levels.

Suspended particulate concentrations measured at 28028 were very low year-round, similar to levels in rural areas (Table 4). All samples met the daily objective.

The trend for suspended particulates is displayed in Figure 10. If this curve is superimposed on a similar one for Kitchener station 26029, it shows that the Guelph and Kitchener stations display identical trends from 1981 to 1988. The variations which occur are likely due to mesoscale phenomena, i.e., long range transport of particulates into the area from distant sources.

Suspended particulate concentrations were also measured near Dolime (a limestone quarry operation) at station 28027 at the sewage treatment plant on Waterloo Ave. (Figure 5). Concentrations were slightly higher than in 1987, but remained below the yearly objective (Table 5). Seven samples out of 60 exceeded the daily objective, some of which could be attributed to Dolime. Correlation of the data with wind direction indicated a weak correlationship with east winds, ie., from Dolime. The main sources of dust at Dolime affecting the station in 1988 were likely fugitive in nature, such as trucking and pit operations. Another dust source in the area was construction on the STP grounds. Nearby home construction may have been a factor as well.

The samples were analyzed for carbonate (limestone is calcium carbonate) and summary statistics are given in Table 4. The carbonate concentrations also correlated with east winds, further confirming Dolime to be a source of particulates in the area.

In the past, the main sources of particulate emissions at Dolime were their lime kilns. As a result of a Control Order served on Dolime in 1986, the company installed scrubbers on the lime kilns in October, 1987. These new scrubbers have been effective in controlling particulate emissions as emissions are no longer visible and complaints of dust fallout have ceased.

TABLE 4

SUMMARY STATISTICS - GUELPH

CONTINUOUS POLLUTANTS

28028 - EXHIBITION/CLARK

POLLUTANT	ANNUAL AVERAGE 1986	1987	1988	1988 MAXIMUM 1 HR	24 HR	OBJECTIVE 1 HR	24 HR	1 YR	NO.TIMES OVER OBJECTIVE(1988) 1 HR	24 HR	1 YR
SULPHUR DIOXIDE SO2(ppm)	0.003	0.004	0.004	0.09	0.03	0.25	0.10	0.02	0	0	0
SOILING INDEX COH(COH's)	-	0.35	0.20		0.8		1.0	0.5		0	0
OZONE O3(ppb)	22.7	23.8	24.0	117		80			138		

OBJECTIVES : 120 (24 hour)
60 (Annual Geo.Mean)

SUSPENDED PARTICULATES - micrograms per cubic metre

STATION	GEOMETRIC MEAN 1986	1987	1988	1988 MAXIMUM 24 HR	NO.OF SAMPLES	NO.TIMES OVER OBJECTIVE(1988) 24 HR	1 YR	SOURCE MONITORED
28028 - EXHIBITION/ CLARK	34	39	39	119	53	0	0	AMBIENT
28027 - SEWAGE TREAT PLANT	53	50	57	200	60	7	0	DOLIME

CARBONATE IN SUSP. PARTIC. - micrograms per cubic metre

STATION	GEOMETRIC MEAN 1986	1987	1988	1988 MAXIMUM 24 HR	NO.OF SAMPLES	NO.TIMES OVER OBJECTIVE(1988) 24 HR	1 YR	SOURCE MONITORED
28027 - SEWAGE TREAT PLANT	0.52	0.20	0.30	8.0	60	No Objective		DOLIME

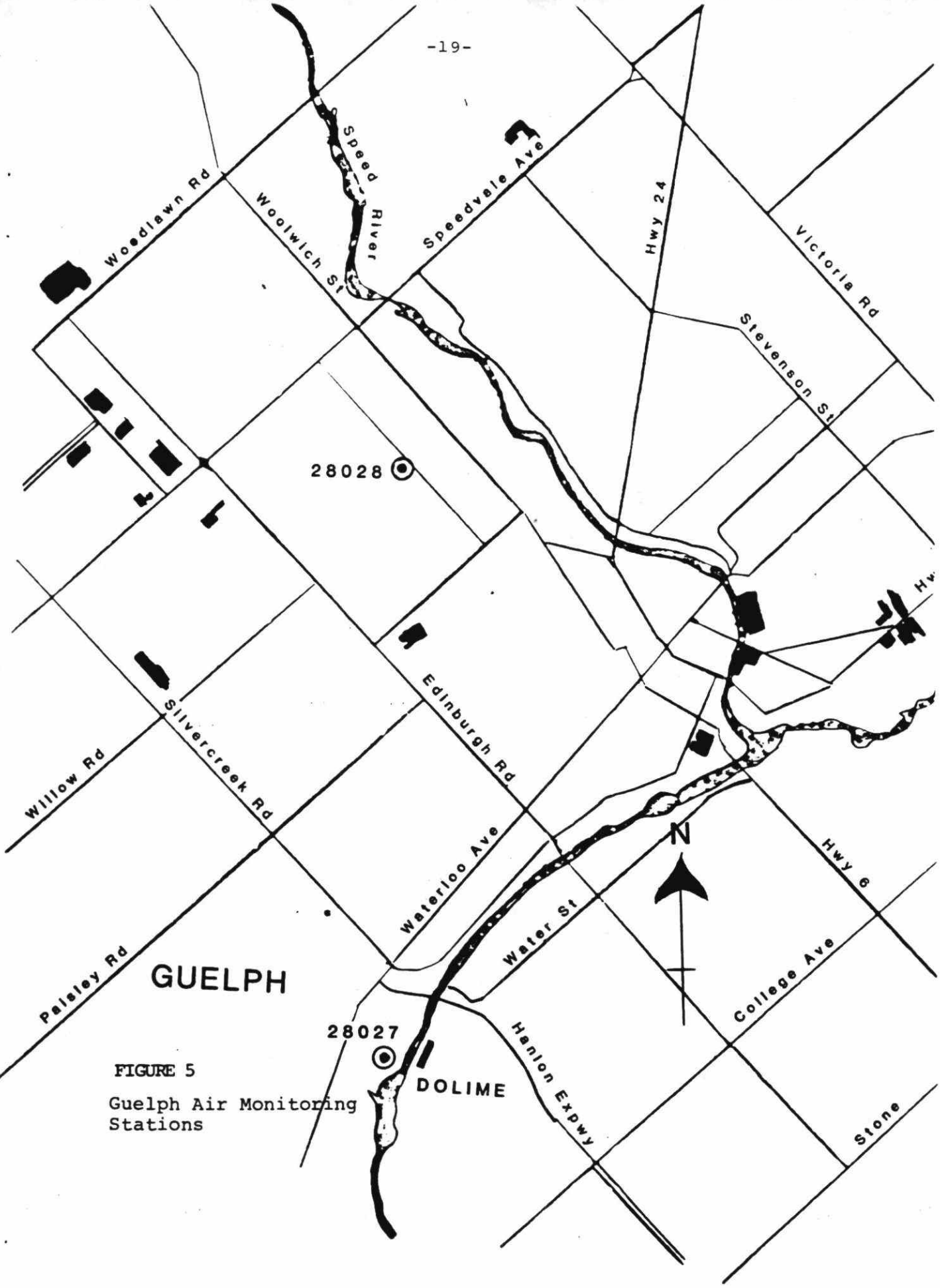


FIGURE 5

Guelph Air Monitoring Stations

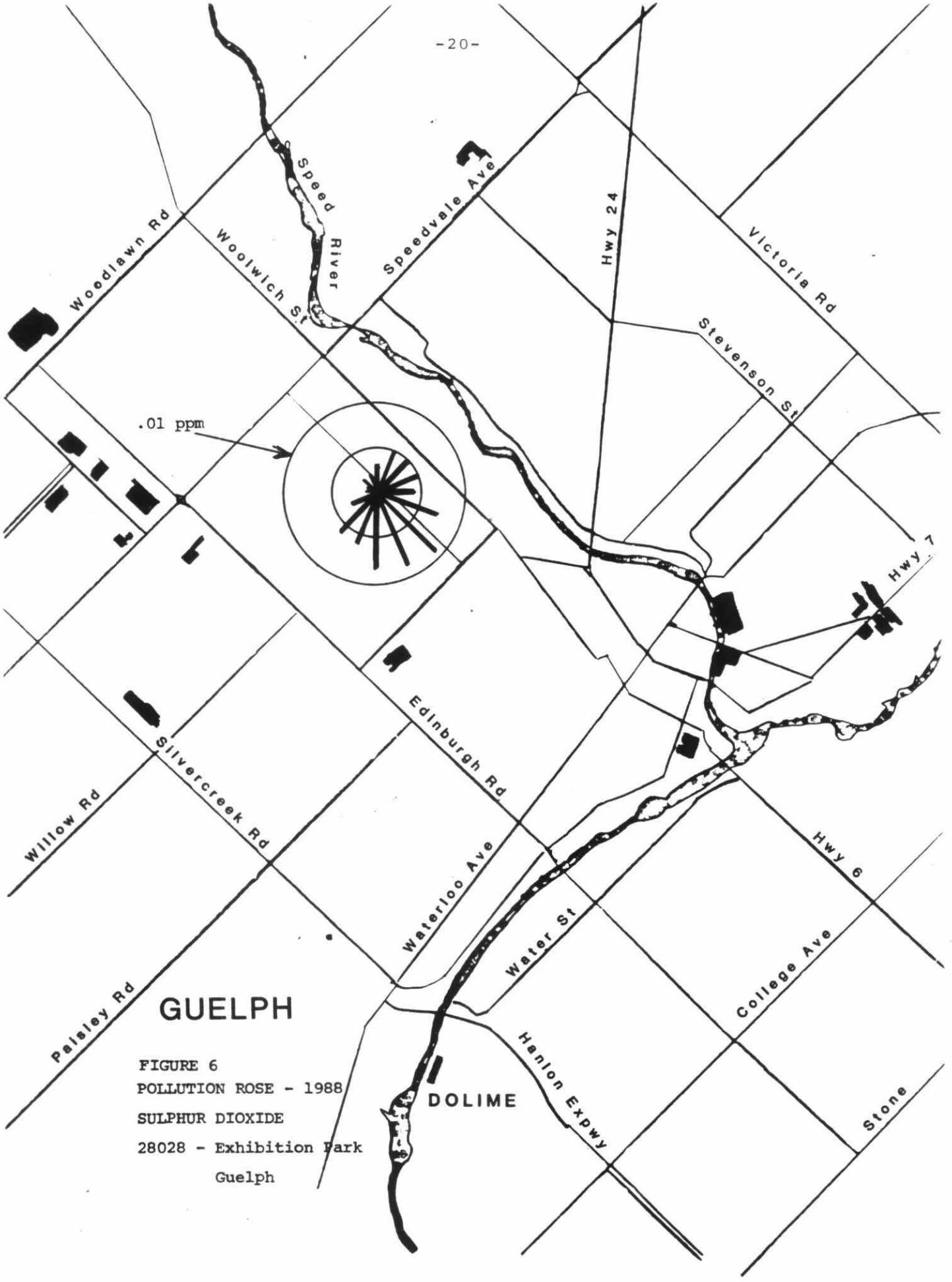
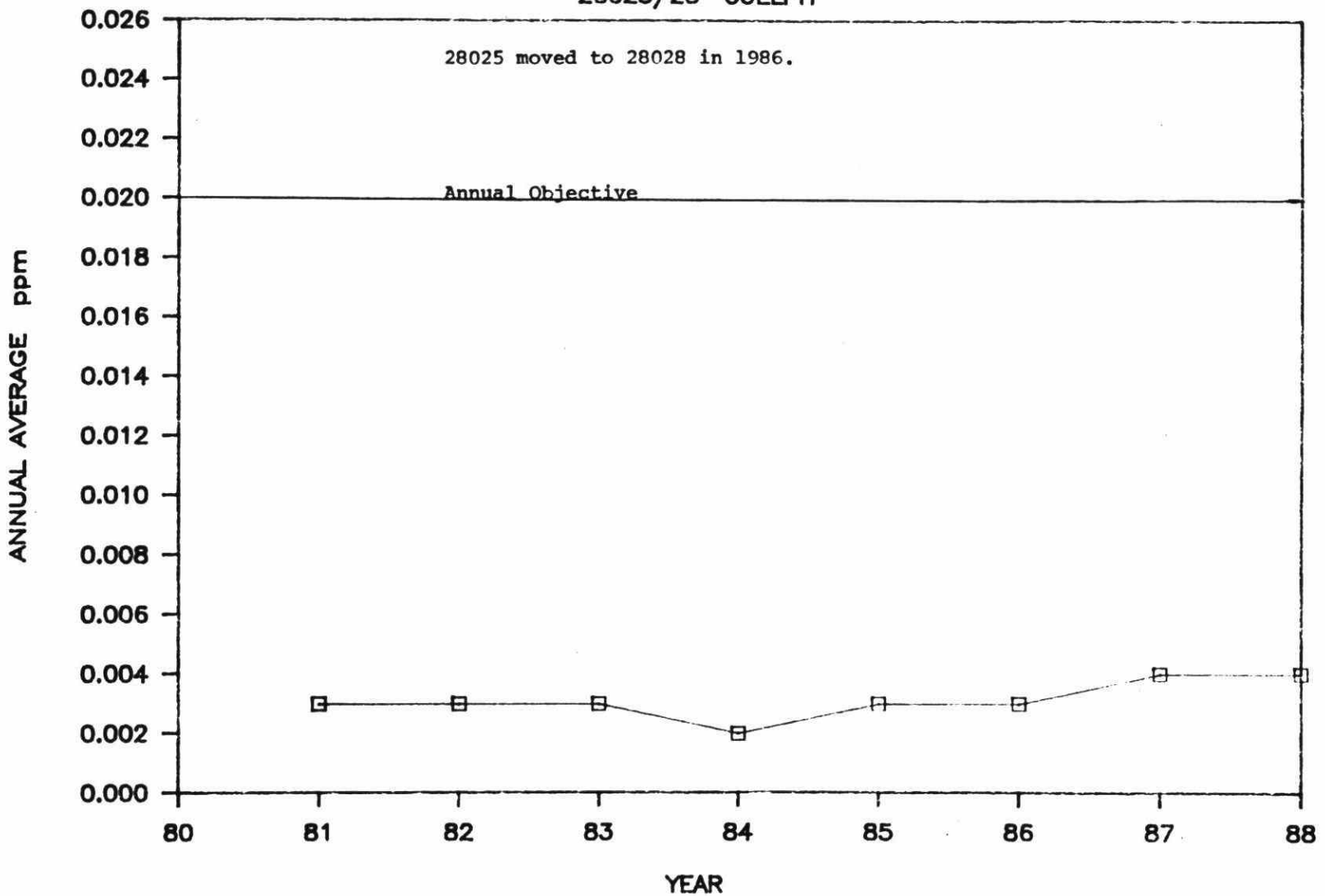


FIGURE 6
POLLUTION ROSE - 1988
SULPHUR DIOXIDE
28028 - Exhibition Park
Guelph

FIGURE 7

SULPHUR DIOXIDE YEARLY TREND



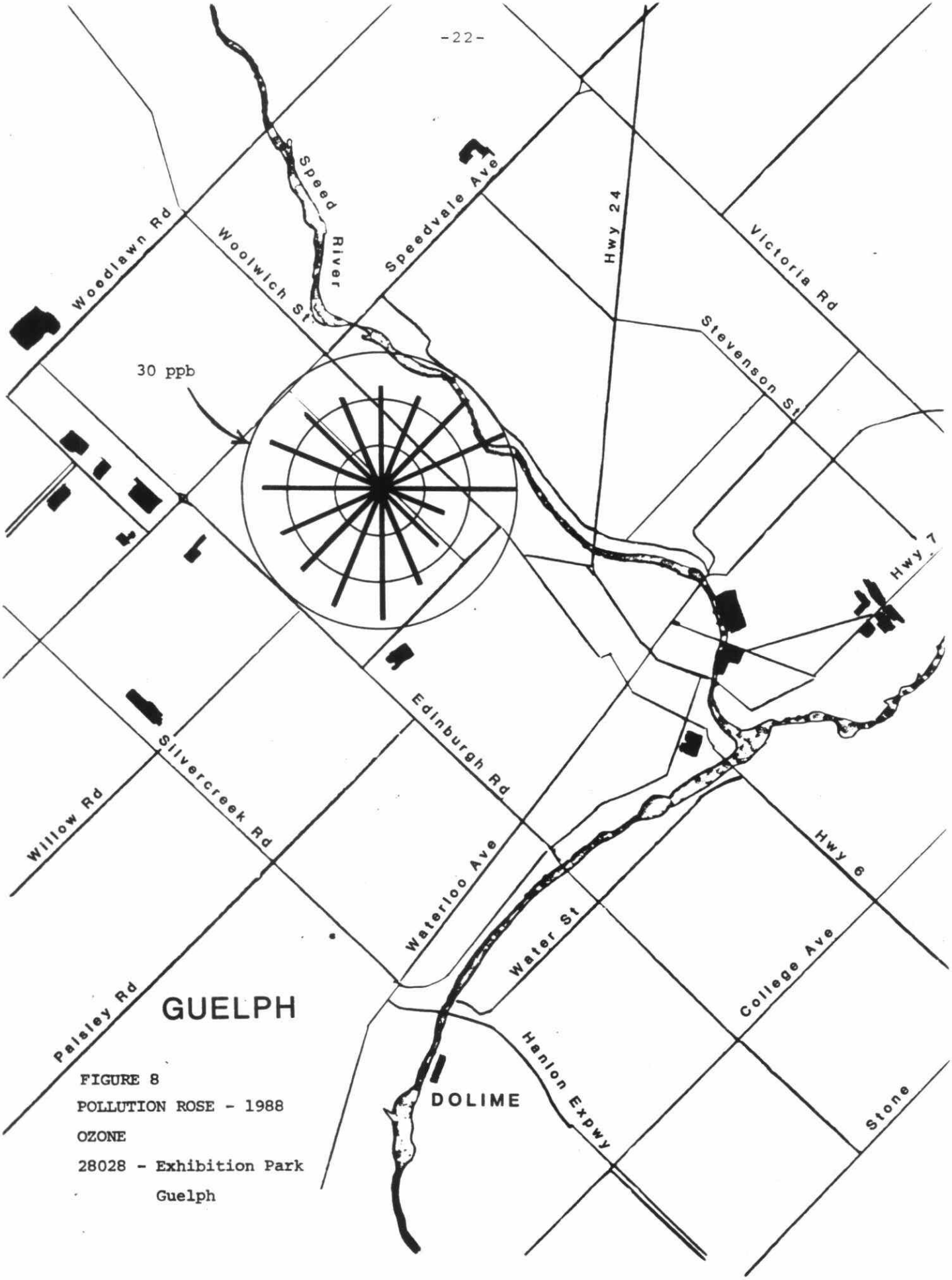


FIGURE 8
POLLUTION ROSE - 1988
OZONE
28028 - Exhibition Park
Guelph

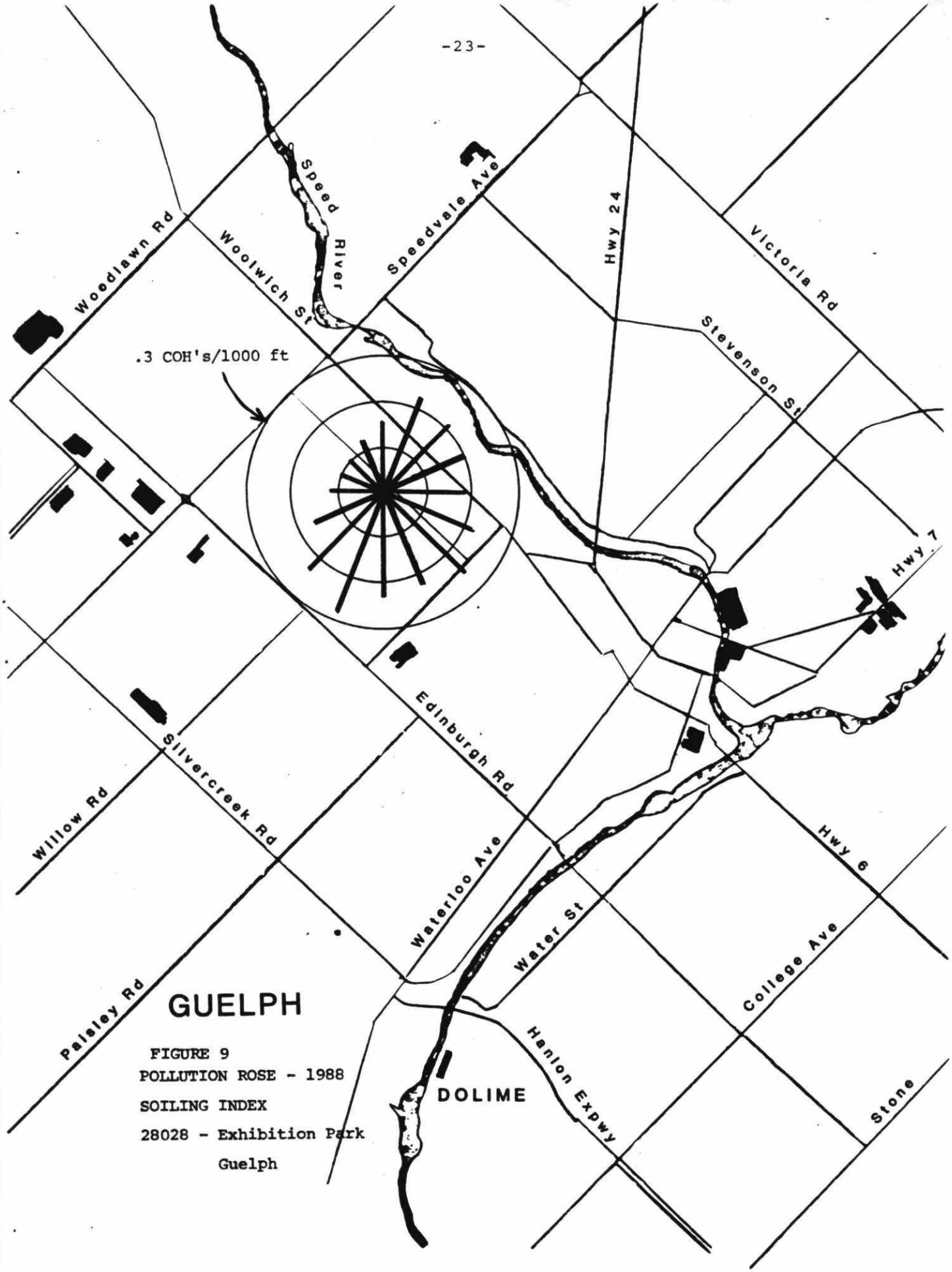
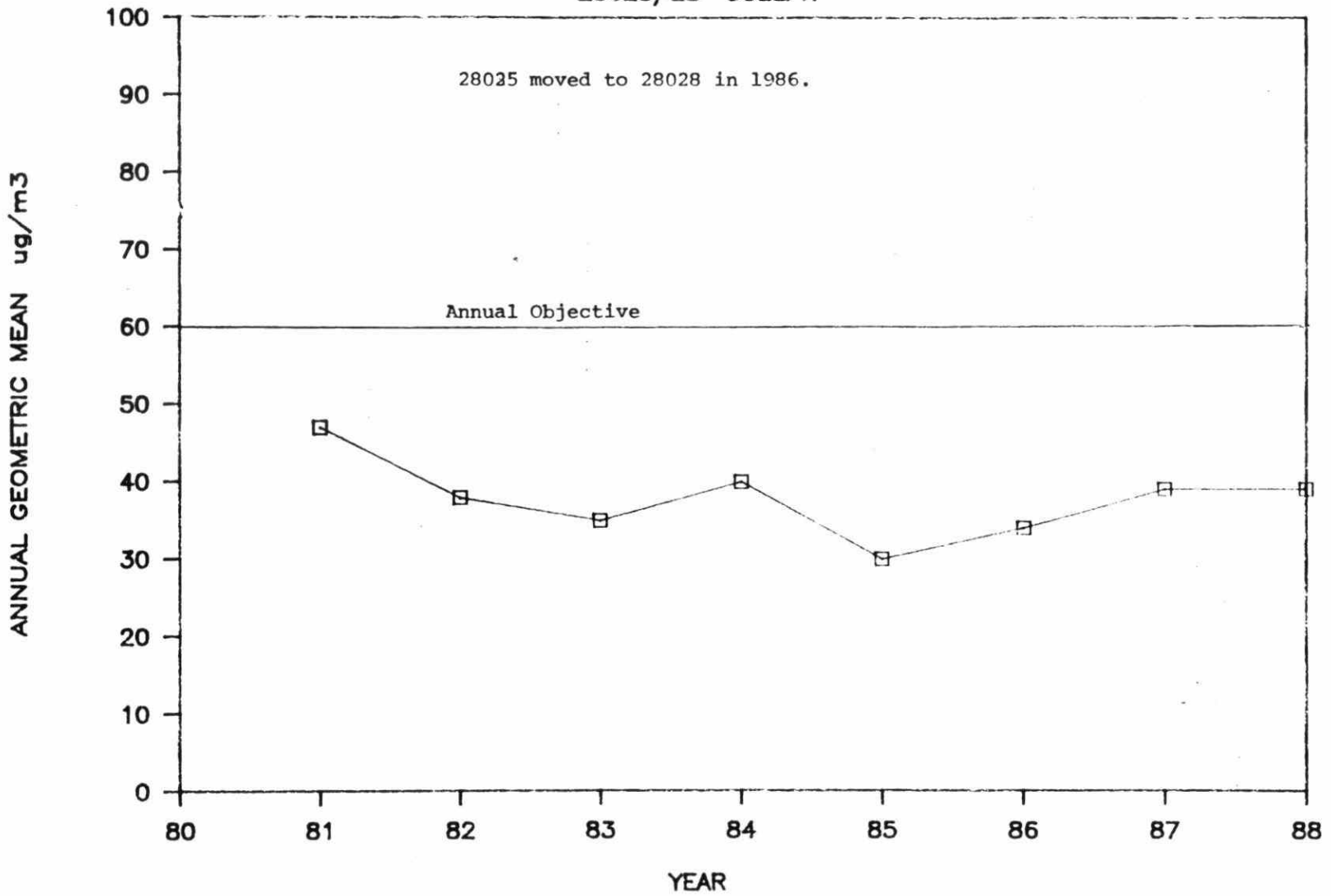


FIGURE 9
POLLUTION ROSE - 1988
SOILING INDEX
28028 - Exhibition Park
Guelph

FIGURE 10

SUSPENDED PARTICULATE YEARLY TREND

28025/28 GUELPH



Kitchener/Waterloo

Air monitoring in this area was conducted at station 26029 at Edna and Frederick Streets in Kitchener and at new station 26045 at Weber and University in Waterloo (Figure 11). The Waterloo station started operations in June 1988 in order to broadcast the new AQI. Both stations showed acceptable levels of sulphur dioxide, soiling index, carbon monoxide and nitrogen dioxide meeting all criteria (Table 5). The latter two pollutants were measured in Kitchener only. Trend graphs in Figures 12, 13 and 14 for SO_2, CO and NO_2 illustrate stable levels dating back to 1977 for the Kitchener station.

Pollution roses are presented in Figures 16 to 20. With the exception of ozone, all peaks for the Kitchener station occurred under northeast, east or southeast winds - from the adjacent Conestogo Parkway. For the Waterloo station, the sulphur dioxide rose was similar to Kitchener's while the soiling index levels were clearly much lower than Kitchener (Figure 20). This clearly shows the significant effect vehicle traffic on the Parkway had on the Kitchener station. Towards August, construction activities very close to the station further added to particulate levels such that 78 hours of Moderate and 2 hours of Poor AQI levels were observed in 1988. The soiling index sampling was suspended since the station is intended to represent Kitchener air quality at large. A new site near Victoria Park has been found for the Kitchener AQI station and it will likely commence operating from there in 1989.

The roses for ozone (Figure 19) peak under southwest winds. When levels were high here they were also high over much of the rest of Southern Ontario.

Due to an extremely hot summer, much higher ozone levels were recorded throughout Southern Ontario. The Kitchener station measured 172 hours above the hourly objective of 80 ppb while Waterloo measured 76 hours, all falling in the Moderate range of the AQI. It is unclear why Kitchener measured so many more higher readings than Waterloo, especially since Kitchener was much more prone to ozone depletion by vehicle traffic. Waterloo did "miss" the month of May, but this only accounted for 25 hours at Kitchener.

Ozone is a photochemical product of long range transport of precursor pollutants (hydrocarbons and oxides of nitrogen) from the United States. It should be noted that southerly winds do not automatically carry high ozone, even during the summer. Specific meteorological conditions are necessary, namely hot, sunny weather. The long term averaging by the rose probably explains why the peaks of the pollution roses are not overly prominent for southerly winds, compared to the other directions.

Suspended particulates measured at Kitchener - Edna and Frederick were similar in 1987 (Figure 21), averaging right at the yearly objective. There were five samples above the daily objective (Table 5), generally on light east wind days. Traffic from the Conestoga Parkway caused the readings. Further, as discussed in the Guelph section, annual trends between Kitchener and Guelph are identical, reflecting mesoscale phenomena, i.e., variations in long range emissions entering the area.

TABLE 5

SUMMARY STATISTICS

CONTINUOUS POLLUTANTS

26029 - EDNA/FREDERICK,KITCHENER and
26045 - UNIVERSITY/WEBER,WATERLOO

POLLUTANT	STATION	ANNUAL AVERAGE 1986	1987	1988	1988 MAXIMUM 1 HR	8 HR	24 HR	OBJECTIVE 1 HR	8 HR	24 HR	1 YR	NO.TIMES OVER OBJECTIVE(1988) 1 HR	8 HR	24 HR	1 YR
SULPHUR DIOXIDE	26029	0.003	0.004	0.003	0.04		0.02	0.25		0.10	0.02	0		0	0
SO2(ppm)	26045	-	-	#0.003	0.07		0.01					0		0	0
SOILING INDEX	26029	-	0.37	*.48			1.8			1.0	0.5			11	0
COH(COH's)	26045	-	-	#.20			0.8							0	0
CARBON MONOXIDE	26029	0.9	0.8	0.9	9	5		30	13			0	0		
CO(ppm)															
NITROGEN DIOXIDE	26029	0.032	0.026	0.027	0.14		0.08	0.20		0.10		0		0	
NO2(ppm)															
OZONE	26029	17.0	17.1	21.6	118			80				172			
O3(ppb)	26045	-	-	#22.0	122							77			

* 8 months of data. Removed in August 1988

7 months of data. Started in June 1988

OBJECTIVES : 120 (24 hour)
60 (Annual Geo.Mean)

SUSPENDED PARTICULATES - micrograms per cubic metre

STATION	GEOMETRIC MEAN 1986	1987	1988	1988 MAXIMUM 24 HR	NO.OF SAMPLES	NO.TIMES OVER OBJECTIVE(1988) 24 HR	1 YR
26029 EDNA/FREDERICK	56	61	60	243	60	5	0

FIGURE 11

Kitchener-Waterloo Air Monitoring Stations

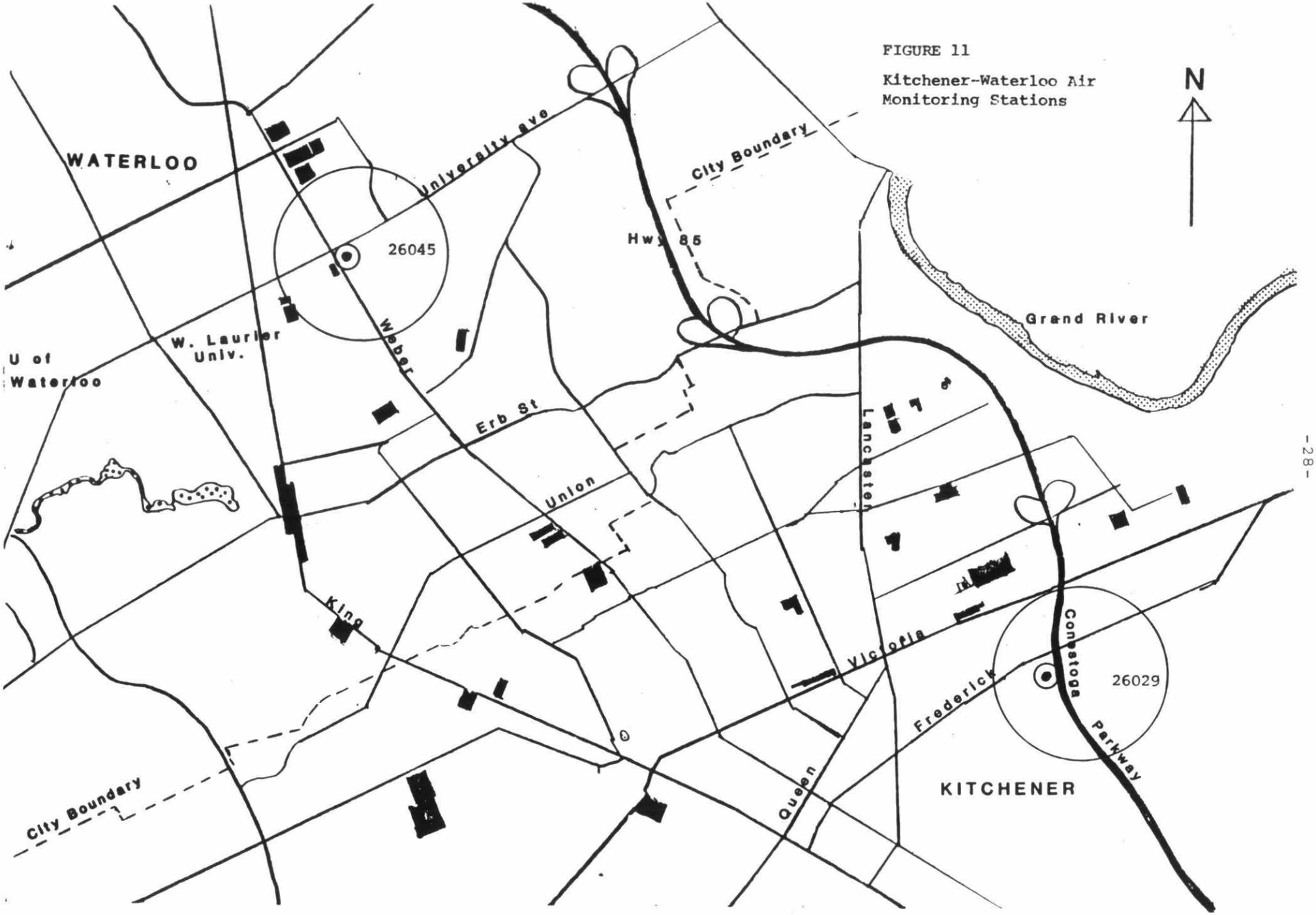


FIGURE 12

SULPHUR DIOXIDE YEARLY TREND

26029 KITCHENER

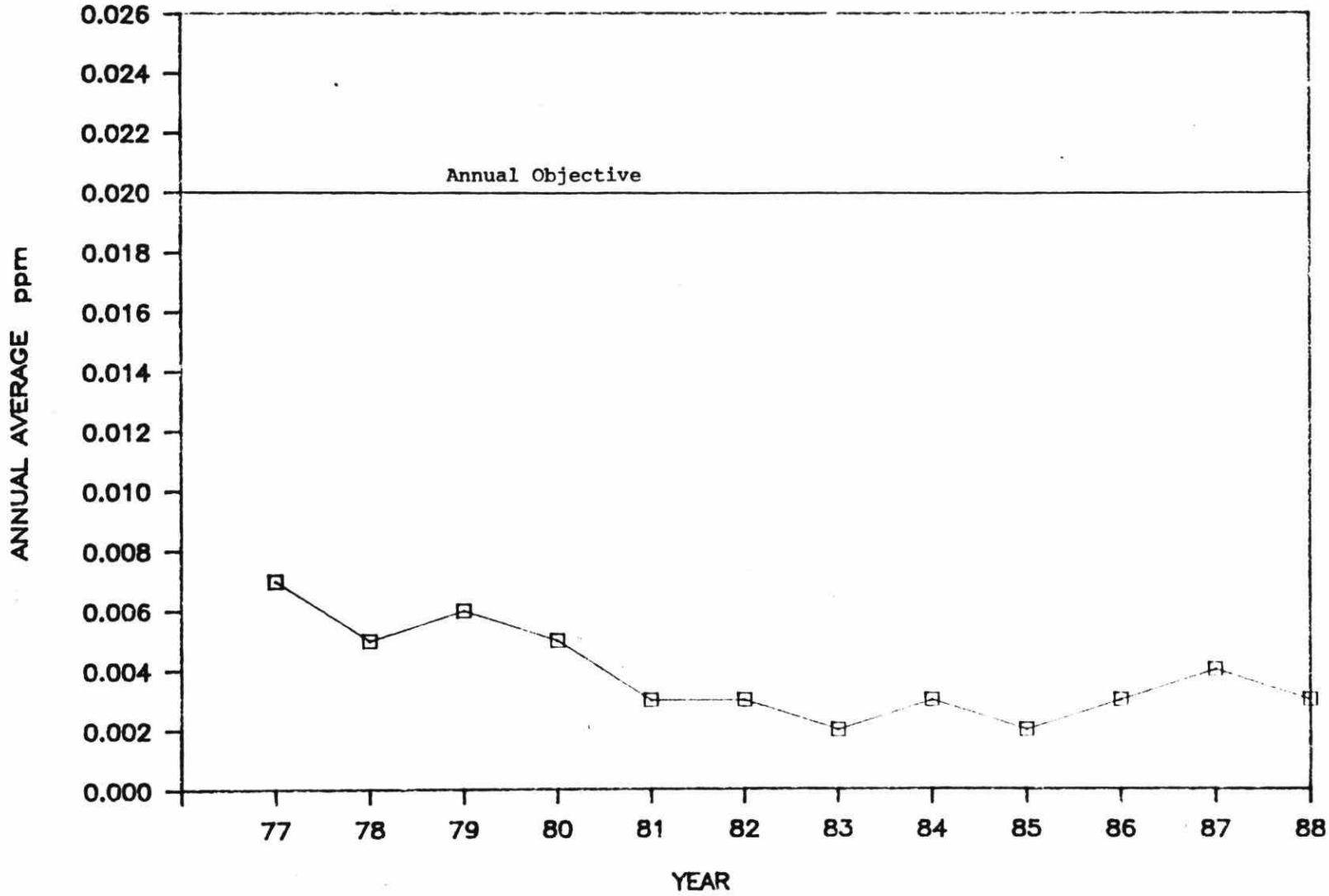


FIGURE 13

CARBON MONOXIDE YEARLY TREND

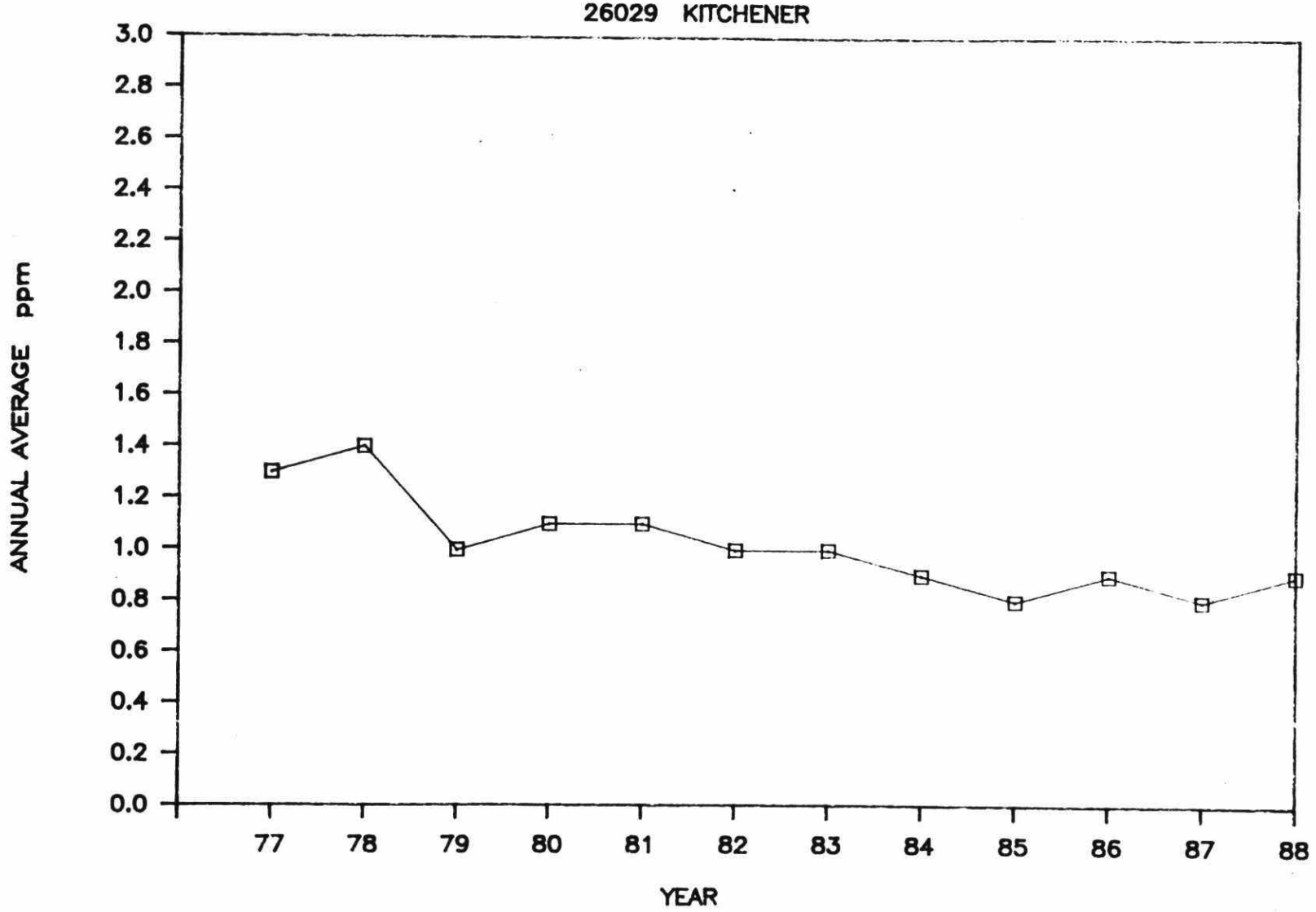


FIGURE 14

NITROGEN DIOXIDE YEARLY TREND

26029 KITCHENER

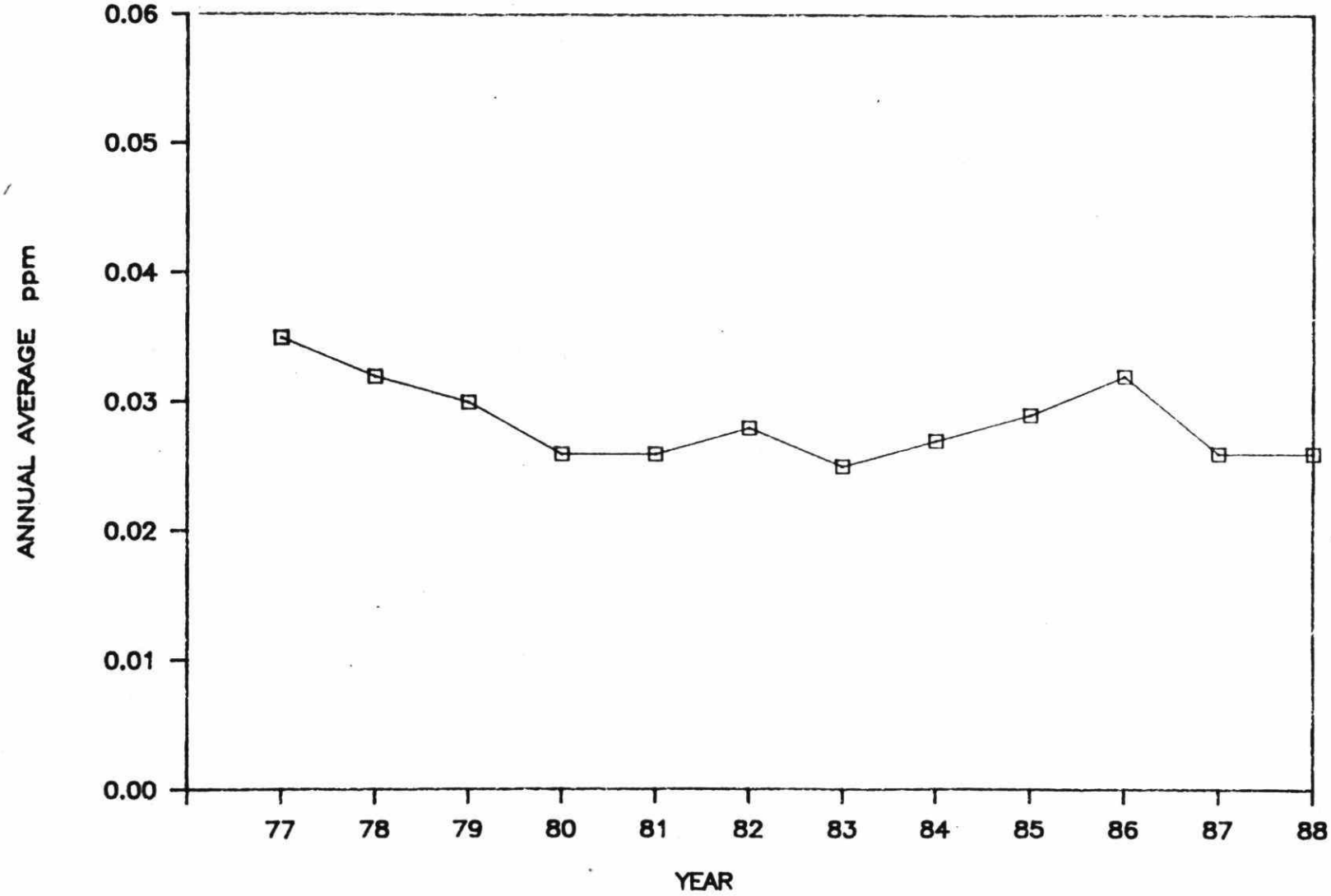
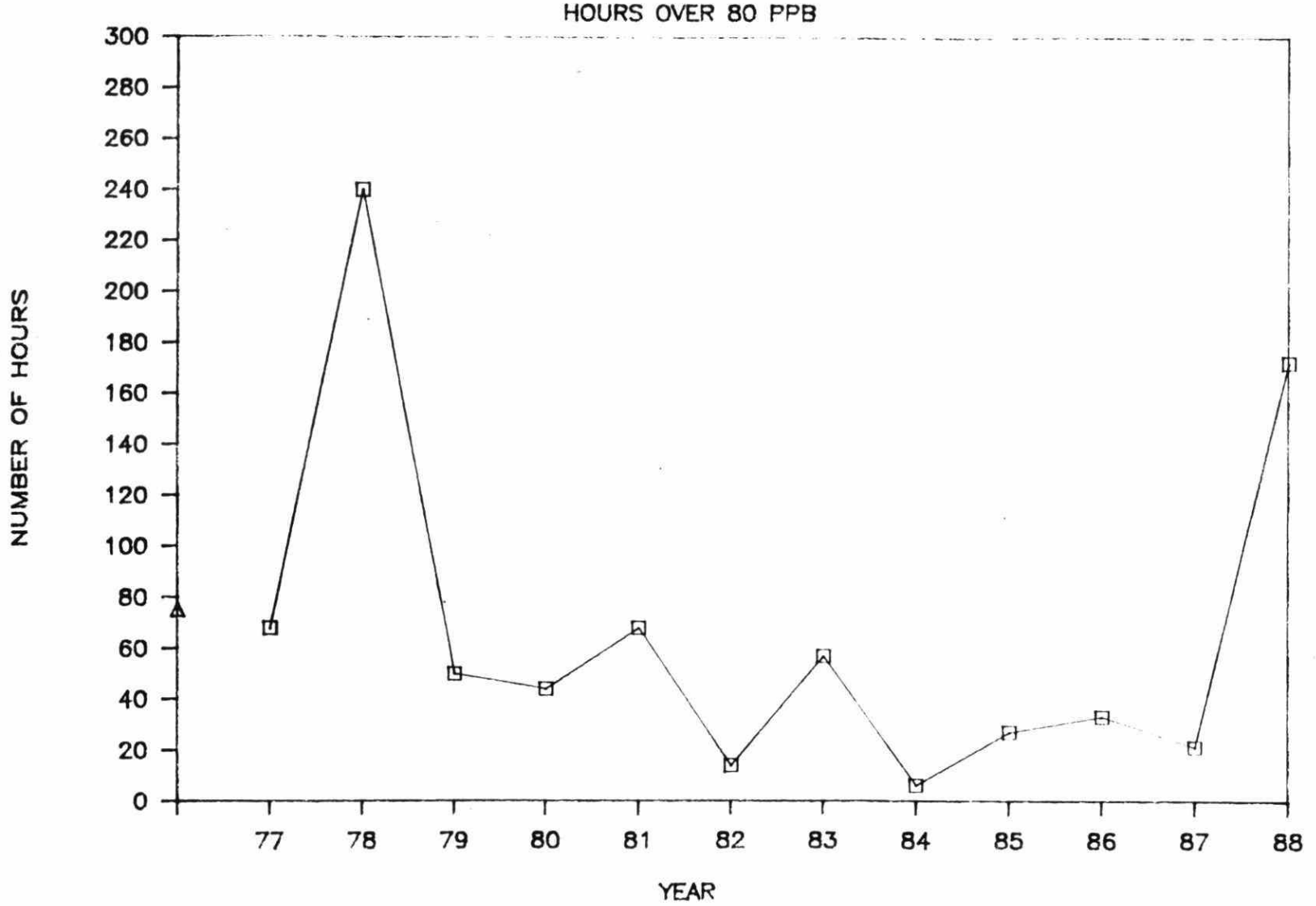


FIGURE 15

OZONE EXCEEDENCE TREND – KITCHENER



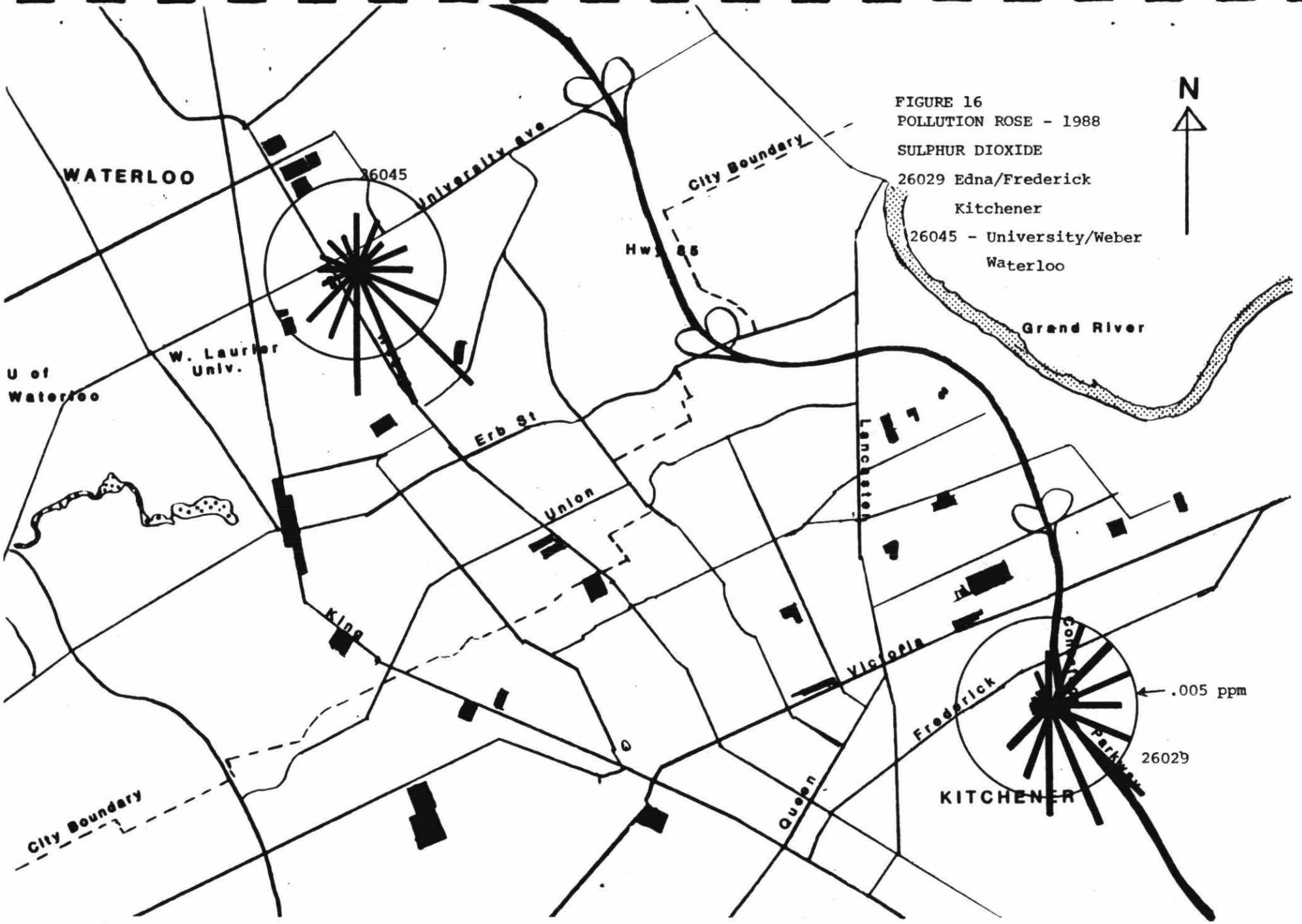


FIGURE 16
POLLUTION ROSE - 1988
SULPHUR DIOXIDE
26029 Edna/Frederick
Kitchener
26045 - University/Weber
Waterloo

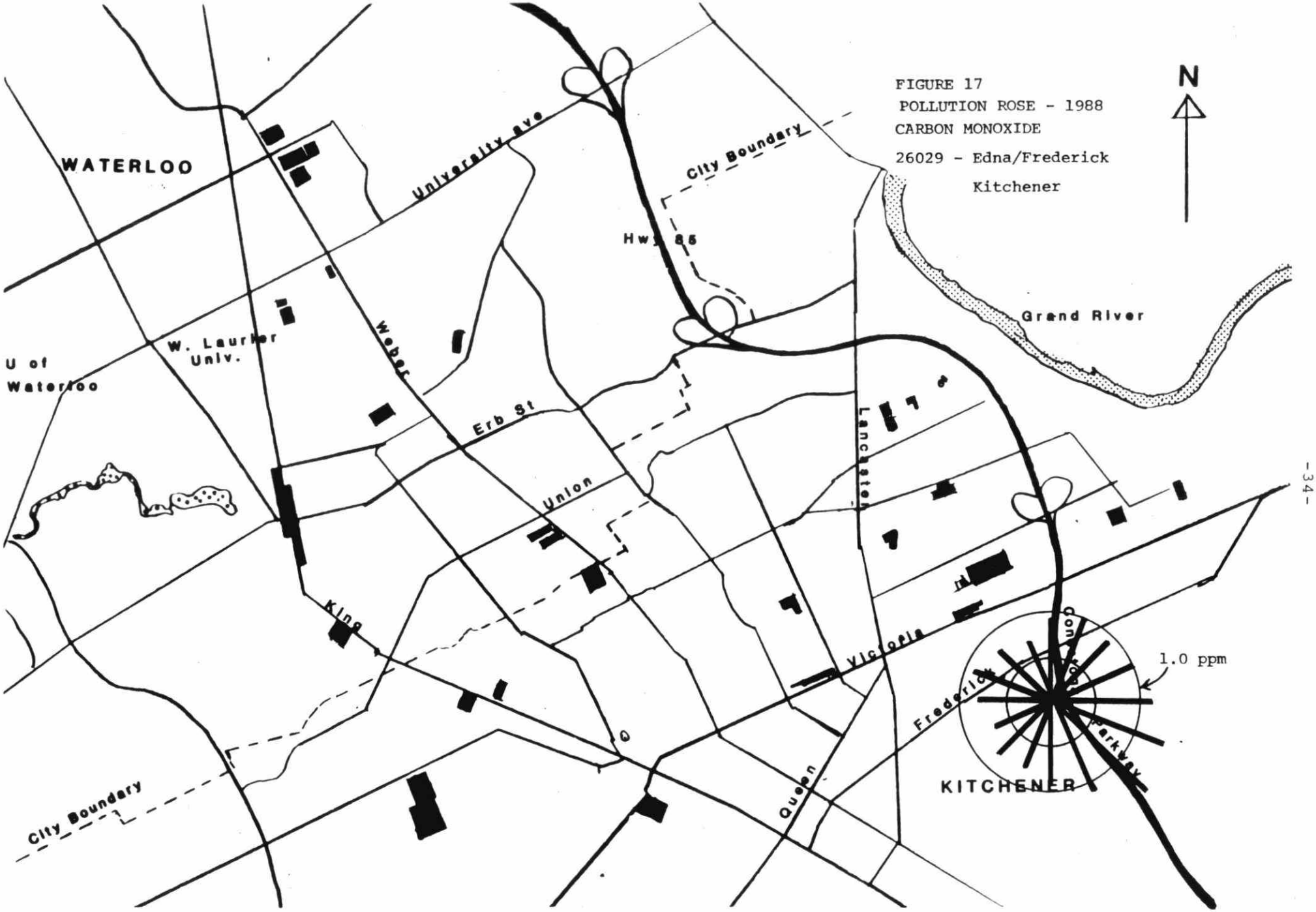


FIGURE 17
POLLUTION ROSE - 1988
CARBON MONOXIDE
26029 - Edna/Frederick
Kitchener

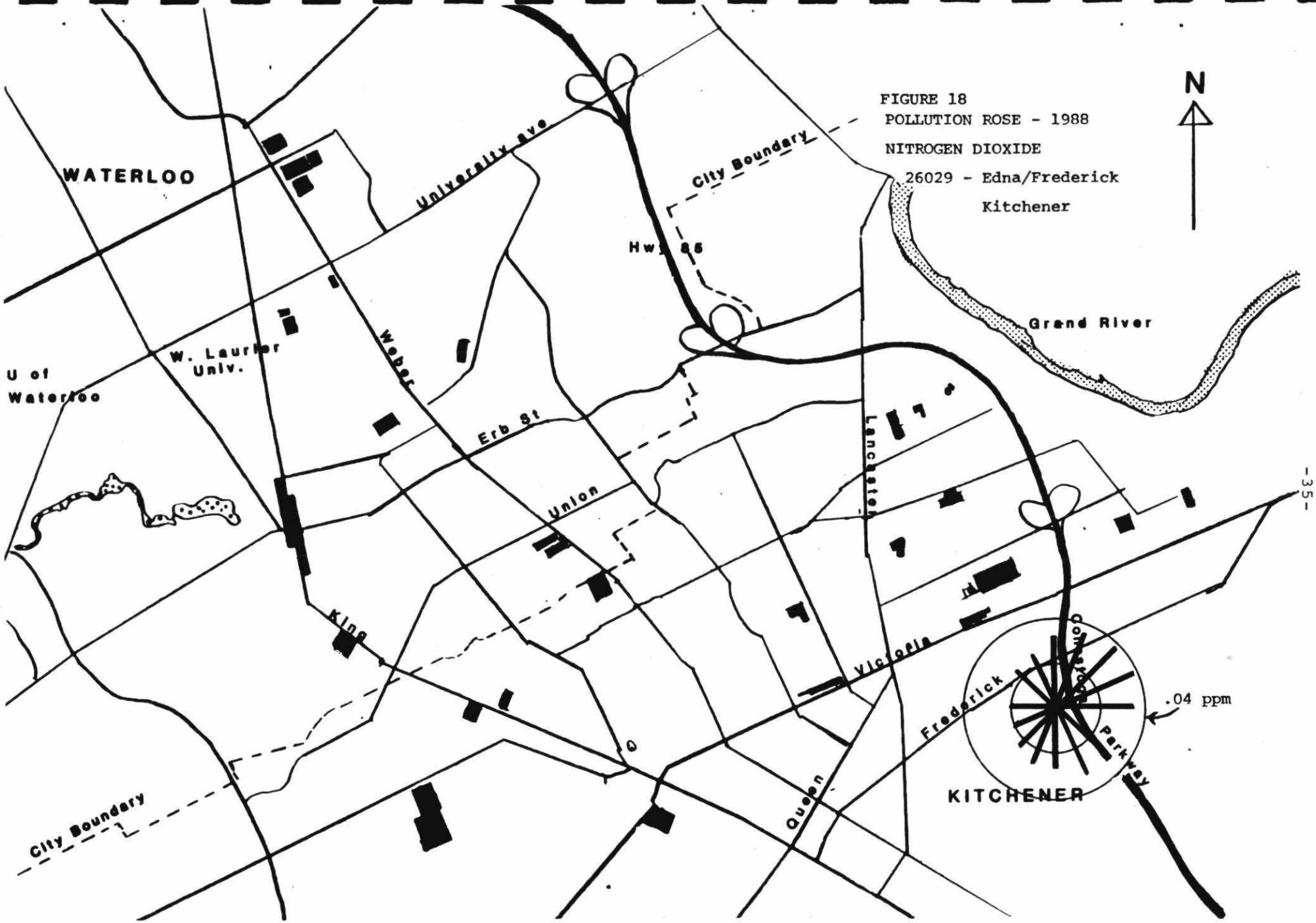


FIGURE 18
POLLUTION ROSE - 1988
NITROGEN DIOXIDE
26029 - Edna/Frederick
Kitchener

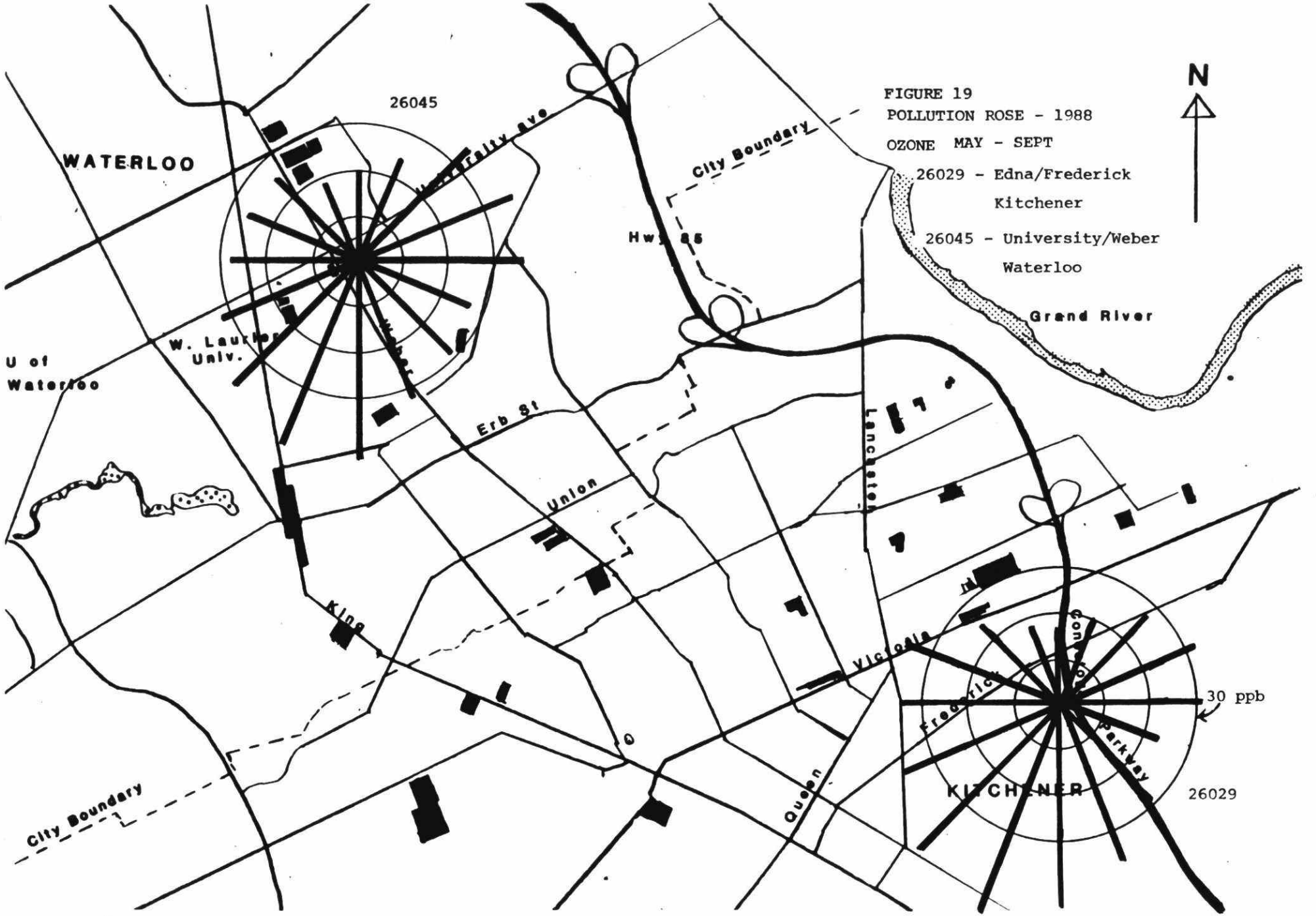


FIGURE 19
POLLUTION ROSE - 1988
OZONE MAY - SEPT
26029 - Edna/Frederick
Kitchener
26045 - University/Weber
Waterloo
N
26045
WATERLOO
City Boundary
Hwy 85
Grand River
U of
Waterloo
W. Laurier
Univ.
Erb St
Union
King
Lancaster
Victoria
Queen
Fredrick
Conestoga
Parkway
KITCHENER
30 ppb
26029
City Boundary

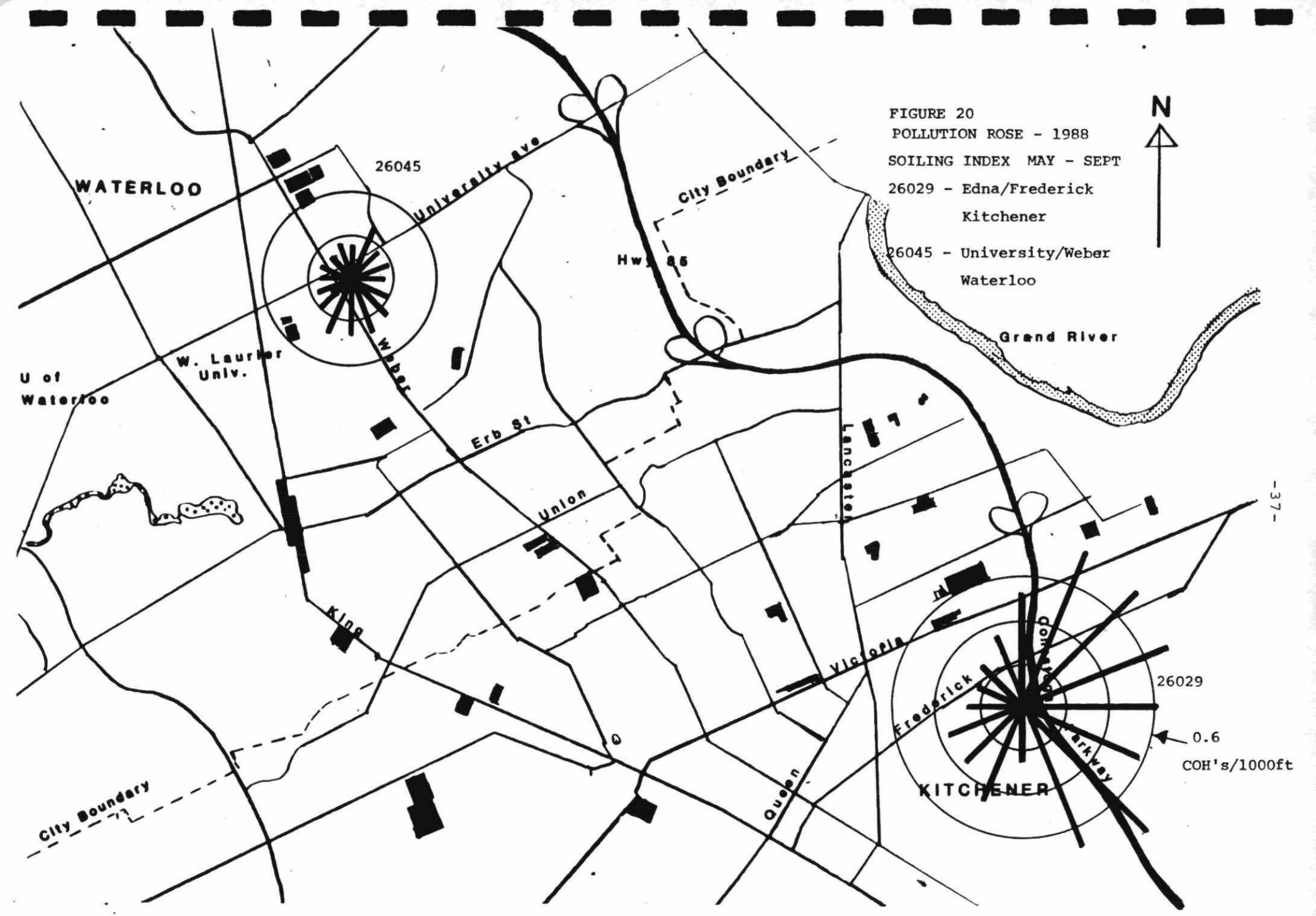
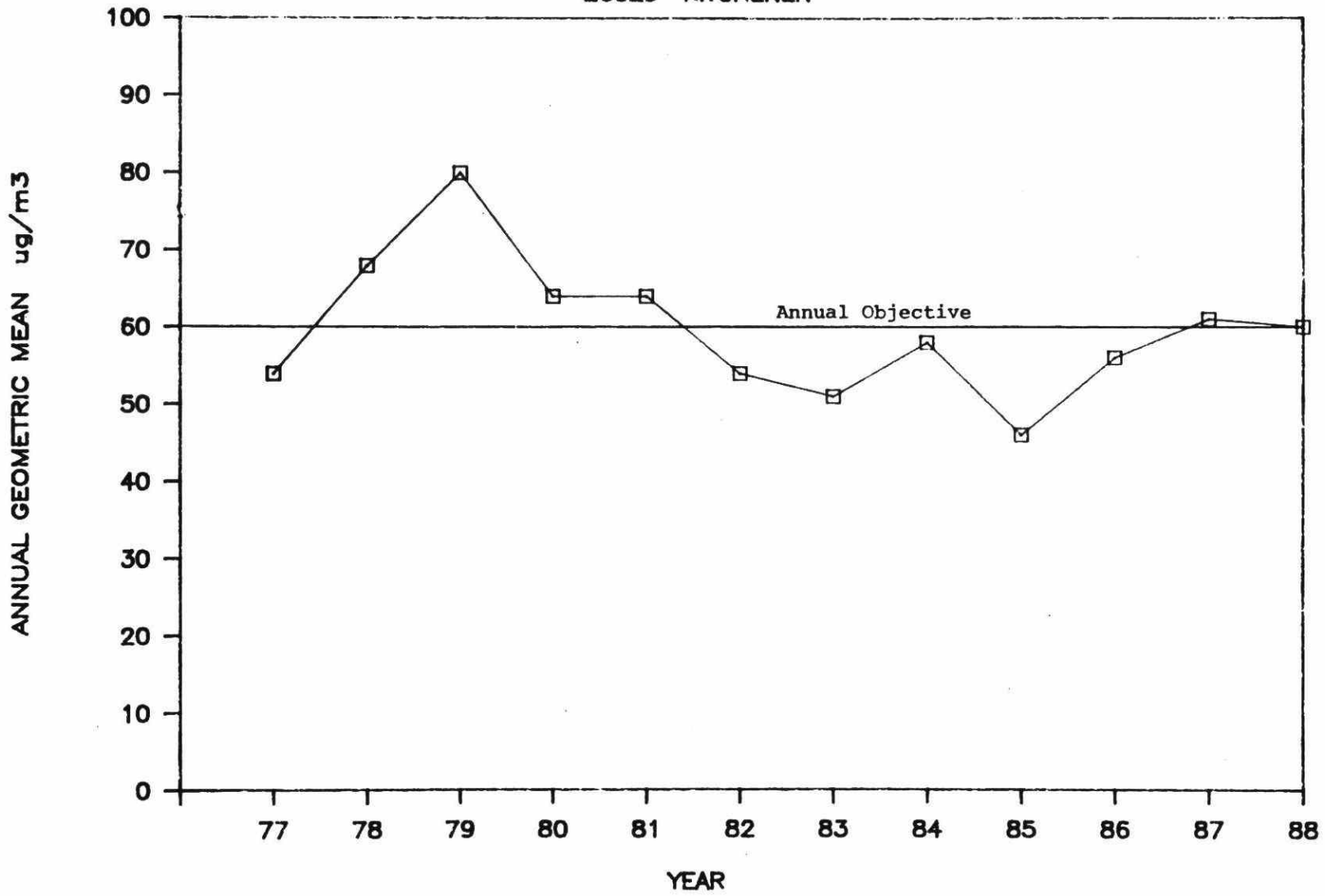


FIGURE 20
POLLUTION ROSE - 1988
SOILING INDEX MAY - SEPT
26029 - Edna/Frederick
Kitchener
26045 - University/Weber
Waterloo

FIGURE 21

SUSPENDED PARTICULATE YEARLY TREND



Puslinch Township

Complaints of dust fallout in past years from Capital Paving Limited, a quarry operation, prompted a survey with dustfall jars starting in mid-1987. Station 28030 was located at the entrance to the plant and 28031 was a control location further away (Figure 22).

In 1988, both stations measured two readings above the monthly objective. In total, over almost two years of sampling up to early 1989, both stations have recorded only 3 excessive readings out of 21 samples indicating that the quarry may have been only a minor source of dust. Thus, the samplers were removed in 1989.

TABLE 6

SUMMARY STATISTICS - PUSLINCH

PARTICULATES NEAR CAPITAL PAVING LTD.

DUSTFALL - grams/square metre/30 days

ONT.OBJECTIVES : 7.0(1 MONTH)
4.5(ANNUAL AVERAGE)

STATION	ANNUAL AVERAGE 1987	ANNUAL AVERAGE 1988	1988 MAXIMUM 1 MONTH	NO.MONTHS OVER OBJECTIVE 1987	NO.MONTHS OVER OBJECTIVE 1988
28030 - CAPITAL PAVING	4.8	4.7	13.8	1	2
28031 - CONCESSION 7	4.5	4.3	10.0	0	2

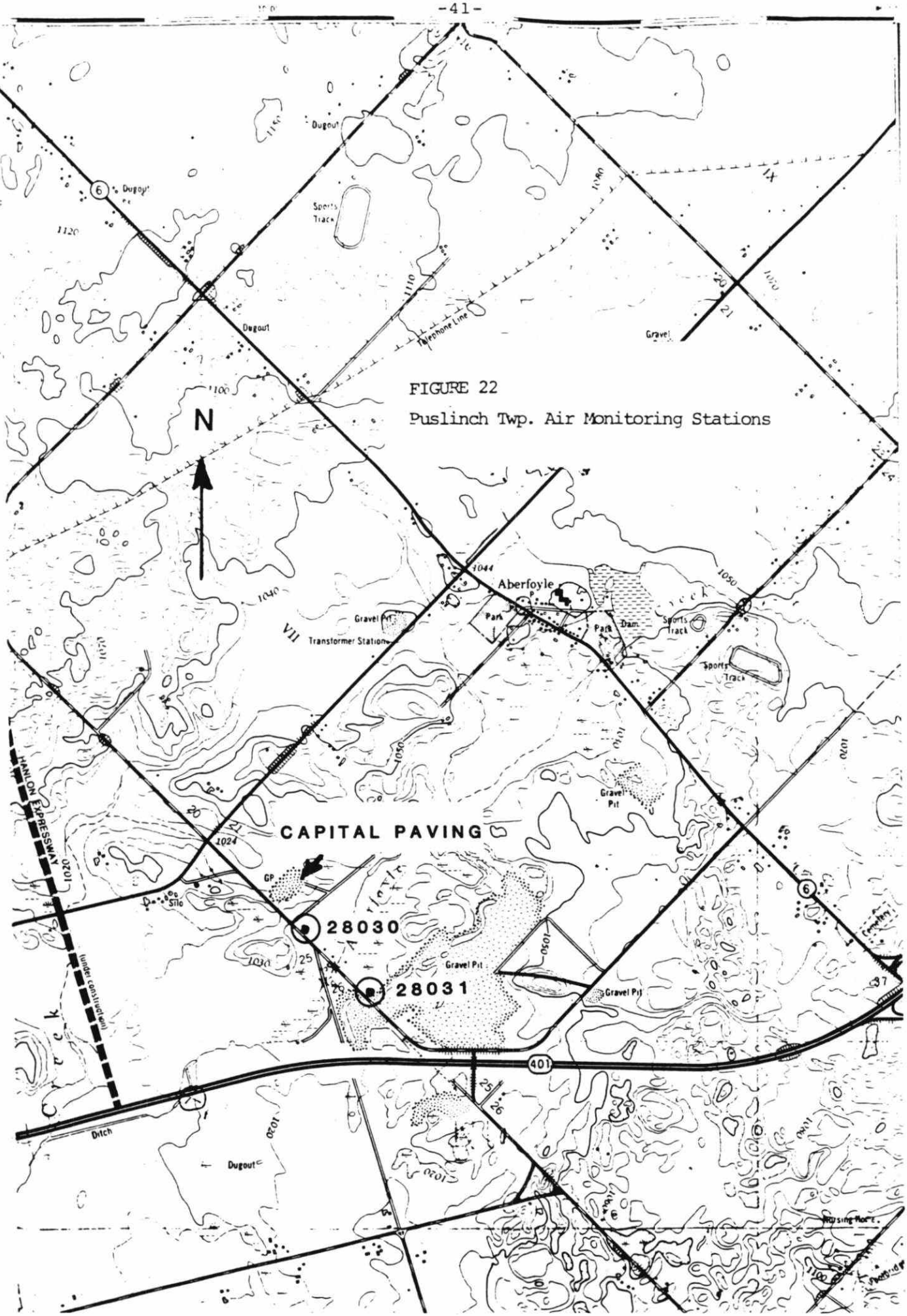


FIGURE 22

Puslinch Twp. Air Monitoring Stations

SUMMARY

This report has summarized the results of routine air monitoring in the Waterloo and Wellington areas. Where local industrial air pollution problems have been identified, the sources involved have already begun or completed abatement programs to reduce their emissions. Other sources monitored showed only minor effects on air quality.

General air quality as characterized by stations in downtown Guelph, Kitchener and Waterloo was very good, with the exception of ozone episodes during the summer, which were common to the rest of Southern Ontario.

In 1988, a new air quality data telemetry system was installed and is operational throughout the Province. This new system permits all of the Ministry's stations with continuous analyzers to send data directly to a central computer facility in Toronto allowing for data availability on a real-time basis. In the past, none of the stations in the Waterloo and Wellington areas were telemetered. Stations with continuous analyzers required manual reading of strip charts which caused delays of several months in the availability of data. The new telemetry system allows for immediate access to the data in Hamilton and in Toronto and also allows for remote control and maintenance of the instruments. Meteorological instruments will be installed, likely in Cambridge, providing wind and temperature data continuously for the area and a new station was installed in downtown Waterloo in 1988. All of this will result in a more efficient monitoring program.

The main purpose of the new telemetry system was to facilitate a new expanded Air Quality Index (AQI). The new AQI is a function of six different pollutants, which form up to 8 separate subindices. Hourly concentrations of sulphur dioxide, soiling index, carbon monoxide, nitrogen dioxide, total reduced sulphur and ozone are all individually converted to the old scale of index numbers with the same advisory or alert levels as the old API, ie., 32, 50, 75 and 100. Not all stations will measure all of the parameters, but the highest hourly sub-index and the pollutant causing it will be reported several times daily to the public. The intent of the new index is to better inform the people of Ontario of air quality in their local area.